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A condensed synthesis of research needs on educational diffucion is provided in the five papers presented at the National Conference on Diffusion of Educational Ideas at Michigan State University in East Lansing, Michigan on March 26-28, 1968. One major paper was presented in each of the five half-days of the conference with time for discussion and exploration of its implications. The 60-70 participants invited represented university researchers, coordinators and administrators of educational research, and diffusion and organization researcher who had not been involved in educational diffusion research. The major papers presented were: (1) Summary and Critique of Educational Diffusion Research, by Richard O. Carlson, (2) Needed Research on Research Utilization, by Ronald Lippett and Ronald Havelock, (3) Needed Research on Diffusion within Educational Organizations, by Everett M. Rogers and Nemi Jain, (4) Innovative Methods for Studying Innovation in Education, by Nan Lin, and (5) Implications for Practice from Research on Educational Change, by Richard I. Miller. (DM)

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Major Papers
Presented
At ~~The~~
National Conference
On Diffusion
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Ideas (East Lansing, Michigan, March 26-28, 1968.)

MARCH 26 – 28, 1968
EAST LANSING, MICHIGAN

Research Implications For Educational Diffusion.

MICHIGAN DEPARTMENT OF EDUCATION
June 1968

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MAJOR PAPERS

presented at

THE NATIONAL CONFERENCE ON DIFFUSION OF EDUCATIONAL IDEAS

sponsored by

The Research Coordinating Unit

of the Vocational Education Division

of the Michigan Department of Education

in cooperation with

The United States Office of Education

and

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and

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of Michigan State University

on

March 26, 27, and 28, 1968

at

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Michigan State University

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REPRINTS

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FOREWORD

One of the most urgent concerns of vocational and technical education--as we seek to improve existing programs and to establish new ones--is to reduce the time interval that exists between research findings and their adoption. The 50-year interval for the adoption of kindergarten and the 18-year interval for the adoption of driver education, for example, cannot be tolerated if education is to keep pace in modern America.

More needs to be known about what happens within and around the local educational agency which brings about the adoption of innovations in education. With this in mind, the National Conference on the Diffusion of Education Ideas was held March 26-28 at Michigan State University.

The conference brought together some of the leading educational diffusion researchers of the Nation. Their papers are presented here as the report of the conference and as a way of facilitating a deserved wider dissemination. The "Preface and Overview" by Dr. Everett Rogers provides an excellent panorama of the papers presented, their purposes, interrelationships, and design for developing the theme of the conference.

The conference was also intended to bring together in meaningful discussion the diffusion researchers and the change agents--the research coordinating unit personnel who are striving to bring about educational innovation adoption through a program of dissemination, stimulation, and coordination. The intermingling and dialogue of the two groups was less extensive than had been hoped; time set aside for informate discussions were used for business sessions needed by Research Coordinating Unit directors.

A general feeling expressed informally and revealed in analyzing the evaluation instruments suggested that this conference should be followed soon by one focused on application of research. In such a conference, attention would be centered on the steps, procedures, and techniques that will result in high adoption levels in the shortest possible time of those innovations that would maximize our educational efforts.

Thus, the conference was highly successful in terms of communication among diffusion researchers, broadening the horizons of information disseminators, and in indicating further research needs in educational diffusion. It was moderately successful in terms of specific helps for disseminators.

The Michigan Research Coordinating Unit is pleased to have had the opportunity to sponsor this conference in cooperation with the U.S. Office of Education and the Department of Communication and the Continuing Education Service of Michigan State University. We present this report with the hope that it will be found useful by the conference participants and other interested persons.

Lansing, Michigan
June 30, 1968

PREFACE AND OVERVIEW

The present report is designed to provide the reader with the major papers that were presented at the National Conference on the Diffusion of Educational Ideas, which was held at Michigan State University on March 26-28, 1968. The conference was conducted by the Michigan Department of Education, jointly with the Department of Communication at Michigan State University. Sponsor of the conference was the U.S. Office of Education.

The conference came about because a number of educational leaders became concerned within the past year or so because: (1) while much public interest had focused upon change in U.S. public education, (2) and while increasing research attention had been placed upon the diffusion of educational ideas, (3) many of these diffusion studies were unfortunately of rather uneven quality, and (4) the leaders in educational diffusion research had little communication with each other.

Since about 1963, there have been numerous conferences and symposia dealing with implications from diffusion research for application and action in educational practice. Examples are the Oregon Conference, the Ohio State University Conference, and the Nebraska Symposium. But none of the publications reporting proceedings from these meetings indicate that a main emphasis was placed upon needed research on educational diffusion. We felt such a session was needed.

Not only is there an obvious practical benefit from such interchange (that is, better conceived and conducted diffusion research, which indirectly leads to improved results for the practice of educational change), but there is also an inherent intellectual value in such forward thinking. Specifically, we felt that the implicit "model" for much educational diffusion research has been taken from agricultural innovation diffusion, which preceded it in time-order. This led to an emphasis, sometimes inappropriately, (1) upon "optional" innovation decisions, rather than collective, contingent, or forced innovation decisions, which are more frequent among schools than among farmers, (2) upon socio-economic characteristics of schools as predictors of innovativeness, rather than upon unique organizational variables (such as social distance between administrators and teachers, the degree of school consensus on innovations, the concentration of power in the administrator's hands, etc.) of the school system, which may also explain its relative innovativeness, and (3) upon school-to-school diffusion, rather than within-school diffusion. In short, we have tended to view schools as if they were farmers, innovation-wise. So one of the themes of the conference was a focus on the concepts that should be studied (but have not been) in educational diffusion, and the methods appropriate to investigate them. In an intellectual sense, one reason to be interested in improving educational diffusion research is because it provides a research setting in which the units are organizations, and individuals within organizations. We do not have many other diffusion research traditions in which an equally appropriate emphasis could be placed upon social structural variables as they affect the diffusion of ideas. Such organizationally-linked variables ought to be a focus of inquiry, rather than ignored, as they largely have to date.

One major paper was presented in each of the five half-days of the Conference, with ample time for its discussion and to fully explore its implications. Among the some 60-70 participants invited to the Conference were (1) university researchers who have been and/or are involved in educational diffusion research, (2) coordinators and administrators of educational research (such as directors of research coordinating units in state departments of education, regional educational laboratories, U.S.O.E., etc.) who have sponsored educational diffusion research or who wish to do so, and (3) diffusion and organization researchers who have not been involved in educational diffusion research to date, but whose work has much to contribute to our discussions by way of offering a "fresh look," so to speak. So we intended to foster interchange not only between our five major paper authors and the 99 conference participants, but also among the participants. A mix such as we planned had not been previously assembled, we felt, and certainly not with a primary focus upon needed research on educational diffusion.

Here is an overview of the five major papers that follow.

1. The first half day focused upon a "Summary and Critique of Educational Diffusion Research," by Richard O. Carlson, University of Oregon. The paper, authored by one of the key participants in this research tradition, deals both (1) with what has been found and how, as well as (2) what is wrong with these research objectives and methods. Brief attention is paid to the historical development of educational diffusion research and the key players in this process, as well as the interfaces and interchanges with other diffusion research traditions. We learn of major trends in educational diffusion research over recent years.

2. The second major paper is "Needed Research on Research Utilization," by Ron Lippitt and Ron Havelock, University of Michigan. The authors deal

with the potential utility of viewing educational diffusion in the larger context of the problem of research utilization. This entails looking at the entire process of how needs for educational research are generated from the perceived problems of educational practitioners, how these research needs are communicated (effectively or ineffectively) to researchers on educational problems, and how the resulting research results are transformed to usable educational innovations, and, finally, how these new ideas are put into practice. Such approach necessarily involves a "systems analysis" of the practitioner-researcher-practitioner communication cycle.

Some observers have pointed out that there are important gaps in this process in education, roles that are not filled or perhaps even recognized. The result is a lack of full utilization of educational research, in part because researchers "scratch where practitioners don't itch," in part because there are breaks in the structured flow of research results to practitioners.

A central cause of such breakdowns is that practitioners and researchers differ widely in their attitudes, research competence, etc.; in short, they do not speak the same language, share the same meanings. Perhaps another cause is the absence of "liaison roles," individuals who seek to link practice and research. Comparisons are made with certain other fields, like industry, agriculture, and medicine, where these liaison roles are structured to bridge the language of research with the language of practice.

So the second paper will outline the research utilization problem in education. It will then focus on needed types of inquiry that should be attempted on research utilization. As such, this approach calls for a considerable widening of what has traditionally been conceived as the domain of educational diffusion.

3. The third paper is "Needed Research on Diffusion Within Educational Organizations," by myself and Nemi Jain, both of Michigan State University. We have already pointed out that most past research in this field has looked at school-to-school diffusion, not within-school innovation flows.

For this type of inquiry; one may need to utilize a different unit of analysis, such as the two-person dyad or chains of interpersonal communication, which might be analyzed with computer matrix analysis. Also, the concepts to be studied must necessarily be different than in the past; emphasis should rather be upon structural variables. In general, a focus in such within-organizational inquiry must be basically upon the relationships among individuals, as structured or determined by the hierarchical aspects of the school systems. The conceptual apparatus of organizational research will be drawn upon heavily in this paper.

4. The next paper is "Innovative Methods for Studying Innovation," by Nan Lin of Johns Hopkins University. There is a necessary interrelationship between the content of what one studies regarding educational diffusion, and the research methods that one utilizes. Advances in research methodologies open the way for different research objectives, for

conceptual progress. Most past educational diffusion investigation has been somewhat stereotyped in its methods. Analytical advancements in other fields of behavioral science have not been incorporated in educational diffusion studies.

While the major attention in the previous three papers is upon needed changes in research content, with only peripheral considerations upon method, the reverse is the case in this fourth paper. The author considers new types of research designs (such as field experiments, simulation, systems analysis, etc.), data-gathering procedures, operations, and data-analysis methods with fruitful potential to educational diffusion. Examples of how other researchers have used these methods are provided, where possible. An analysis of the interpersonal communication structure among teachers in three Michigan Schools are used as illustrative data.

5. The last paper is "Implications for Practice from Research on Educational Change," by Richard Miller, University of Kentucky. A number of new approaches in practice have implicitly or explicitly been based upon past research on change in education; examples are the regional educational laboratories, research and development centers, the Title III projects, innovation-demonstration approaches, and, in some states (like California and New York), regional educational planning and development centers (often as part of Title III activities).

The effectiveness of these recent approaches to planned educational change will be discussed as an essential background to needed research on these approaches. Lastly, possible future restructuring of U.S. public education will be briefly considered, with attendant implications for needed study. The viewpoint in this last paper is primarily upon recent and future procedures in educational change, and how they might be subjected to inquiry.

We feel that these five papers, taken in concern, offer the reader a condensed synthesis of the research needs on educational diffusion. For bonus, he receives numerous implications for action and practice. The authors of these papers join me in hoping that the present report is one step forward in the progress of research on educational change. If so, our objective has been realized.

Everett M. Rogers
Professor of Communication
Michigan State University

(Conference Co-chairman)

East Lansing
May 14, 1968

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SUMMARY AND CRITIQUE
OF
EDUCATIONAL DIFFUSION RESEARCH

by

Richard O. Carlson

The title of my paper is a "Summary and Critique of Educational Diffusion Research." This means that it is my job to order the existing research so that it becomes clear what it all adds up to in the sense of what is known, what is not known, how what is known was achieved and in general provide some critique of the field. This is a large task because there are so many studies of the diffusion of educational innovations. However, the limited time which has been wisely allocated to this presentation permits only a general summary. The task is not only large, but difficult. A monument to the difficulty of putting together the diffusion research on educational innovations is Donald Ross' book, Administration for Adaptability (1958). Those of you who know the book, which resembles a summary of the Mort studies through 1958, will painfully recognize that he was apparently forced by the eclectic nature of the research to resort to a cut and paste procedure in compiling the story.* And in the process Ross produced the most difficult to read book in the educational literature.

In trying to order the literature, I have been unable to stay within the arena reflected by the title. This is simply by way of a warning that what follows consists of a short course on diffusion of innovations, some noise about needed research, as well as a general summary and critique of existing research on the diffusion of educational innovations.

I find the process of delivering a paper which summarizes and critiques research to be rather embarrassing. It is rather like sending a rude letter and then being present when it arrives.

Research on adoption of educational innovations has a rather long history. Throughout this history diffusion research has been associated most closely with the specialty in education called educational administration. It seems fair to say that the diffusion literature is as sophisticated and as well developed as any other area of scientific study to which those in educational administration have given their attention. This observation, however, should not be interpreted as laudatory.

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*Since the 1930's Mort and his students have completed about 200 studies of the "adaptability" of public schools.

A curious element exists in regard to critiques on diffusion research in education. That is, since nobody pays much attention to diffusion research, no one has produced a critique. Or perhaps Rogers (1962, p. 39) said all that needs to be said when he reported that "The education diffusion tradition is one of the largest in number of studies . . . but this tradition is probably one of lesser significance in terms of its contributions to understandings of the diffusion of ideas."

One of the features about diffusion research in education which may account for the lack of critiques of the area has to do with the historical development of the field of study. Far more than in any other academic field, the history of diffusion research in education has been tied to one man, Paul Mort. Probably eighty to eighty-five percent of the work done was done under his direction at Teachers College, Columbia, from the late thirties until the early sixties, and virtually all of the research was carried out by his doctoral students. No one outside of this group seemed to be sufficiently interested to assess the research, and understandably the doctoral students were somehow reluctant to criticize the establishment. Furthermore, during this period the studies produced evidence that money spent on schools was related to innovativeness; and I expect that this finding was quite acceptable to school people generally.

Without speculating further about the lack of critiques of diffusion research, I must get on with my own critique.

To begin, let me remind you that the terms "adoption" and "diffusion" describe only a very narrow slice of the world of change in education. One way to think about this change process is to focus on what can be called the natural history of an educational innovation. This natural history, or life cycle of an innovation, must consist of the story of the invention, development, promotion, adoption, diffusion, and demise of the innovation, along with an account of the problems encountered and solutions developed in introducing and maintaining the innovation in the school setting, and the unanticipated consequences growing out of its use.

Not only are diffusion and adoption small parts of this vast concern, they are by and large currently rather unpopular concerns. I am quite sure that if one were to do a word count on recent writing about change in education he would find no more than three or four words per hundred devoted to adoption of diffusion.

I say all of this simply to indicate that my assignment is narrow, given the whole host of concerns surrounding change in education.

When the word adoption is used, it ordinarily refers to a decision to use a new idea or practice. Diffusion is used to refer to the spread of a new practice to and among potential users. Naturally the terms are connected with each other. To order my review and critique of adoption and diffusion studies I am going to follow what currently seems to be the accepted definition of diffusion: the process of diffusion is defined as the (1) acceptance, (2) over time, (3) of some specific item--an idea or practice, (4) by individuals, groups or other adopting units, linked to (5) specific channels of communication, (6) to a social structure, and (7) to a given system of values or culture. I will use each of the elements in the definition as an accounting scheme in terms of which adoption and diffusion studies in the field of education are to be reviewed and assessed.

There is no single study on the diffusion of an educational innovation which takes into account all of these elements. In fact, there are very, very few studies in any field which take all of the elements into account. Studies of the diffusion of educational innovations tend to ignore channels of communication, social structure and value systems. Whereas studies in the field of anthropology emphasize value systems, and studies in sociology tend to ignore value systems and concentrate on channels of communication and social structure.

I will now consider each of the elements in the definition of diffusion.

1. ACCEPTANCE

The dependent variable in most studies of diffusion is acceptance of the new idea or practice. There are two basic research problems which surround the notion of acceptance. The first problem is a definitional problem: What is meant by acceptance? The term has been variously defined in the literature all the way from _first_ use to a decision to continued _full_ use of the innovation. Naturally the studies of educational innovations reflect the vagueness of this term. This gives rise to a problem of comparability of studies. We have in education the general usage of first use as the definition of acceptance, but some of the research involves percentage use; that is, acceptance is recorded only after a certain percent of potential users in a school system are using the practice. Until such time as a precise definition is adhered to, findings can only be very cautiously compared.

The second problem with the notion of acceptance has to do with evidence of acceptance. Said another way, how do those who conduct diffusion studies know whether or not an innovation has been accepted? There are generally three ways of knowing if an innovation has been accepted. One is by observation, one is by evidence contained in written records, and one is through confirmation by a school official. Some of the studies of the diffusion of educational innovations have relied on observation; that is, some of Mort's early studies* did so. Most studies, however, have tended to rely on confirmation from a school official. As you well know, all three of the procedures for documenting acceptance have their own special problems. Nevertheless, no one has done a comparative reliability study of the three procedures.

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*e.g., Mort and others, 1945; Mort and Cornell, 1937; Mort and Pierce, 1947.

In addition to concern about these important problems of nailing down the dependent variable there is concern about how school people or school systems go about making a decision. Although the general diffusion literature has fairly well documented the awareness, interest, evaluation, trial, and adoption sequence in the acceptance decision, the educational literature is strangely silent on the matter of the adoption decision.

A meager start has been made by Mort and Cornell (1941) in examining some elements of the adoption decision process. They have produced figures showing the various positions taken by administrators, school boards and teachers in adoption decisions ranging from leadership to opposition. The figures suggest that administrators play a leadership role in adoption decisions. But the evidence reported contains a very strange note. This strange role appeared because Mort and Cornell looked both at past adoption decisions and at current ruminating about innovations. In terms of past adoptions administrators were reported to have played a leadership role; however, in terms of current considerations of innovations, administrators were reported to have maintained a position of neutrality. This inconsistency may simply be documentation for what many people already think they know--that administrators always get the credit or blame.

Nevertheless, there is a major need for good descriptive studies of acceptance decisions and, beyond this, there is a need to relate findings of the acceptance decision to other matters of diffusion. All of this is of particular importance because of the fact that educational innovations move through complex organizations. Adoption decision making in complex organizations must differ in some important ways from individual adoption decision making. Those who study educational innovations have an opportunity to make a substantial contribution to knowledge of diffusion by describing the way in which adoption decisions are made in complex organizations; but so far they have failed to do this.

2. OVER TIME

Diffusion studies are necessarily time oriented studies. The element of time is one of the vital features of all such studies. Naturally it takes time for a new idea to spread. Strictly speaking, time of acceptance is a core problem in diffusion studies. Diffusion studies attempt to classify adopters in regard to the timing of their acceptance, seek to understand varying rates of acceptance in different localities, and to chart diffusion curves.

Regardless of the centrality of time in diffusion studies, very few, if any, studies of educational innovations reflect an admirable job in identifying the time of the acceptance decision. Far more care needs to be exercised in pinpointing the time of adoption if diffusion studies are to provide a firm knowledge base.

Part of this neglect can be traced to the difficulty of obtaining time data, because the event--acceptance--took place in the past, and most often records are unavailable or fugitive. Faced with this problem, those who have reported diffusion studies in education have relied on an informant to recall the time of acceptance data are reliable.

In spite of the centrality of time in adoption and diffusion studies, time as a variable was employed rather late in the history of such studies in education. Mort's first two measurements of "adaptability"--A Guide for Self-Appraisal of School Systems" (Mort and Cornell, 1937) and "The Growing Edge" (Mort and others, 1945)--were designed solely to ascertain whether or not the new practice was present, and contained no time dimension. It was only after about a decade of research on adaptability that time was identified as a variable (with the use of the Mort-Pierce Time Scale and the A.P.S.S. Time Scale). Thus, a good deal of the research examined amount of adoption and not rate of adoption.

Because time of adoption and the number of adopters at any given time are relatively easily quantifiable, there exists the real possibility of constructing mathematical models of the real world of diffusion. This, then, would permit the construction of theoretical models of diffusion based on a variety of assumptions and thus comparisons of explanatory models with mathematical models of the real world. Such work could be very fruitful, but to date it has not been undertaken by those concerned with the diffusion of educational innovations.

So far in this review the picture is rather bleak. The base data for diffusion studies are acceptance and time of acceptance. I have suggested that studies of the diffusion of educational innovations are weak on both counts: Data collection on acceptance has not been characterized by rigor, nor has that pertaining to time of adoption. Given this weak base it is rather difficult to count on what is known about the diffusion of educational innovations.

3. THE INNOVATION: A NEW IDEA OR PRACTICE

Innovation generally connotes a new, modified or improved practice or idea. Somehow an innovation is linked to an invention. Inventions usually are in a raw state and need considerable development before they are ready for the "market." The development process, as I have indicated, is outside the range of consideration in diffusion studies. In other words, the innovation becomes real to one concerned with its diffusion only when it is ready to be used by its potential adopter.

Seemingly, marketable practices occur in education far more frequently then marketable ideas. Research on the diffusion of ideas is a far more complex process than research on the diffusion of practices. When the item is an idea, the research is concerned with a host of problems such as trying to determine whether or not the meaning of an idea is the same for all individuals, or for all societies. This is a rather difficult problem, one about which those doing diffusion studies in anthropology worry a good deal. However, educational researchers who deal almost exclusively with practices, worry about it very little.

As indicated, diffusion studies in education deal in the realm of practices. Most often such studies are concerned with large numbers of practices. Of the instruments Mort used to collect adoption data, the first dealt with 183 practices, the second with 149 practices, the third with 22 practices and the fourth with 33 practices (Mort and others, 1945; Mort and Cornell, 1937; Mort and Pierce, 1947). In recent years the trend has been to study far fewer items, and in some cases to study just one practice.

There are two major problems encountered in specifying new educational practices for the purposes of diffusion research. One problem is how to classify items or practices in such a way that research results are generally comparable. Suppose one studies the diffusion of school summer camps, or of team teaching, or of programmed instruction. Unless some classification scheme exists which permits one to say that a given new practice is more like team teaching than it is like school summer camps, then each study exists as a discrete case and the findings cannot be generalized. No such classification scheme exists for educational innovations, nor do adequate classification schemes exist for other types of innovations.

The development of such a classification scheme is difficult. The basic problem is that no one seems quite sure what are the relevant dimensions of an educational innovation. And no one has tried very hard to find out. Rogers (1962, p. 124) has suggested that innovations can be classified or characterized on the basis of five points: relative advantage, compatibility, complexity, divisibility, and communicability. An attempt has been made to use this classification scheme as a way of accounting for varying rates of diffusion of several educational innovations (Carlson, 1965). A panel of educators was asked to rate each of six widespread educational innovations by applying these five characteristics to each of them. The ratings indicated rather generally that the panel of educators could not distinguish among the innovations on these five points. Several things could be implied by the results: all six of the innovations were alike in character (which seems unlikely because the diffusion patterns were very different), or these characteristics have no application to these educational innovations, or the cynic might infer from the results that educators don't think about educational innovations, they just adopt them.

At any rate, a scheme for classification of educational innovations is needed if any generalizable results are ever to emerge out of diffusion studies.

A second major research problem involving the item or innovation is related to the definition of what constitutes the new practice. Unfortunately for diffusion researchers in education, school people seem quite prone to modify new practices in the process of adopting them. For example, what is called team teaching in one system is very different from what is called team teaching in another system. This means that the researcher must specify with care in advance what features are essential to the new practice and make certain that the practice which is accepted in one locality is essentially the same practice which is accepted in other localities. Those who have studied educational innovations have generally failed on this point.

Up to this point I have been dealing with acceptance of specific new practices over time. All of this is part and parcel of the dependent variable in adoption and diffusion studies; all of this forms the basis for such studies. My charge included saying something about the results or knowledge gained from the many adoption and diffusion studies in education. I am now ready to begin feeding in findings as we turn now to independent variables.

But, before turning to matters related to adopting units, channels of communication, social structure and values, I want to make sure that the message so far is clear.

In speaking of matters related to the dependent variable (acceptance over time of a new practice) I have suggested that . . .

. . . the term acceptance is variously defined in the studies.

. . . documentation of acceptance of a new practice has been weak.

. . . insufficient attention has been paid to identifying the time of adoption.

. . . no classification scheme of new educational practices has been developed. Thus, the literature is a collection of discrete cases.

> . . . the research studies give no assurance that the new practice was essentially the same in all instances in which acceptance was recorded.

To continue, then, with the accounting scheme I will turn to adopting units.

4. ADOPTING UNITS

In the vast majority of diffusion studies the adopting unit has been the local school system. A very few studies have looked at adoption by individual teachers. The main thrust of the diffusion studies, then, has been to account for varying rates of adoption by those entities called school systems. Almost no attention has been paid to varying rates of adoption among individual schools within a school system.

If the literature then is oriented toward accounting for varying rates of adoption among school systems, the first question to be addressed is: What characterizes the explanatory schemes that have been followed? What theories were called upon or developed to provide an explanation? What mind sets were operating as the researchers approached this task? The orientation of the studies conducted under Paul Mort (which constitute about 80% of all diffusion studies) has been made very clear. In the preface to Adaptability of Public School Systems Mort and Cornell (1941, p. xi) said:

> For more than a decade the senior author of this book has cast his lot with those seeking to maintain local initiative in the control and financial structure or states moving

> toward central financing in education. He has pleaded for free play for local initiative; he has opposed tax and budgetary limitation laws; he has pleaded for rehabilitating the tax structure under local initiative by lightening the burden of the property tax. He took this position in the faith that local initiative contributes to adaptability and that it should therefore not be destroyed without a demonstrably effective substitute.
>
> During the past three years both authors have been engaged in an attempt to appraise local initiative, to understand how it operates, to find out when and how, if at all, it really contributes to adaptability, and to discover the possible substitutes for it if there are any.

Beyond this research orientation identified with the Mort studies, the most common orientation taken by those doing diffusion research on educational innovations consists of elements rather loosely connected to what might be called communication theory; notably the two-step flow of communications hypothesis. The two-step flow hypothesis calls attention to channels of communication and to personal relations of various kinds among those who receive communications.

Research in the educational tradition outside of these two frameworks has been exceedingly eclectic; by and large it has not been guided by any discernable framework or orientation. Said another way, no theory of diffusion has guided research on educational innovations, nor has one been developed from such research. This should not be surprising, since the same picture holds for diffusion research in all traditions. There is no real agreement on concepts involved in adoption behavior and there has been no adequate synthesis of concepts into a general theory. Further, it has been only recently that educational research has begun to be integrated with and rub shoulders with research in the other traditions.

Be this as it may, the startling fact is that even though the research has taken the school systems as the adopting unit, very limited attention has been paid to concepts related to organizational theory. School systems have been seen as adopting units; school systems are complex organizations. The fact that school systems are organizations has been generally overlooked. Even though a complex organization is the adopting unit few attempts have been made to move organizational theory into the arena of diffusion studies. To me this is alarming because diffusion research in education has been associated with educational administration; it has been associated with that branch of education which should be greatly concerned with organizational problems, concepts and theories. I am further saddened by the lack of concern with organizational theory because it is on this score that I believe that those doing research on diffusion of educational innovations can make a significant contribution to the total field of diffusion studies. Most research on diffusion has its setting in other than complex organizations. Most research deals with individual, independent practitioners, such as farmers and physicians. This is not the case when educational innovations are involved. So researchers can and should bring organizational theory into explanatory schemes, but they have failed to do so.

In indictment of researchers for inattention to organizational theory I must acknowledge the existence of some exceptions. Richard H. Davis, in a dissertation completed in 1965, made some use of what could be called organizational theory in examining adoption of innovations in a liberal arts college. And Herbert Eibler also completed a dissertation in the same year which explored some organizational variables as related to adoption of innovations among high schools. So at least a start has been made.

Of the four elements in the definition of diffusion which are frequently used in studies attempting to explain adoption, that is, the adopting unit, channels of communication, social structure and values, well over ninety percent of the variables studied in education are related directly or indirectly to the adopting unit. Said another way, when one examines all of the variables used by educational scholars in adoption and diffusion studies virtually all of them describe some aspect of the school system. Very few deal with channels of communication, social structure or values.

The many variables which bear on the characteristics of the adopting unit which educators have called into play to account for varying rates of adoption can be grouped under five large headings: (1) "Financial Characteristics," (2) "Administrative Factors," (3) "Personnel Factors," (4) "Student Characteristics," and (5) "Community Characteristics."

I will now give a brief description of the style of questions asked in each of these areas and some information about correlations with rate or amount of adoption of innovations.

In regard to financial characteristics, the questions have focused on wealth, tax rate, expenditure per pupil, and internal allocation of funds. The most productive of these questions has been the one dealing with expenditure per pupil. Ross (1958, p. xi) concluded, after reviewing the Mort studies, that "If but one question can be asked, on the basis of the response to which a prediction of adaptability is to be made, the question is, 'How much is spent per child?'" In the many, many studies which have employed this variable, correlations have been reported which range from a -.25 to a plus .70. In the more recent studies there is a tendency for the correlations produced to fall toward the lower end of this range.

The questions raised about administrative factors constitute a rather odd collection. Aside from the use of organizational theory in the studies by Eibler (1965) and Davis (1965), mentioned earlier, the variables can be illustrated by this set: use of standing committees by school board, method of selection of board, and grade division plans such as 6-3-3 or 8-4. The findings suggest that such variables are not useful.

The variables having to do with staff characteristics can be subdivided into three groups: (1) those concerned with personal factors, such as age, sex and marital status, (2) those concerned with professional factors, such as amount of education, recency of education, and experience in educational organizations, and (3) those concerned with group characteristics of the staff, such as social cohesiveness and morale. The use of the last two mentioned variables has been exceedingly rare. The other variables appear in great abundance. Measures of correlation between rate or amount of adoption and staff characteristics of the type mentioned here have generally been of low order. The fact that the studies of staff characteristics have produced inconclusive results may be the result of asking the wrong questions, or it may be that the right questions have been asked but asked of too many people. Said another way, the attempt has been to account for variation among school systems and the tendency has been to ask everyone his age, amount of experience, irrespective of and without understanding of who plays what part in the adoption decision. Thus significant findings may have been buried or hidden. Or to paraphrase Churchill in reverse, "Never has so little been asked of so many."

In addition to variables regarding financial, administrative, and staff characteristics, adoption studies have probed the area of student characteristics. Here the concern has generally run toward such factors as number of students, the level of their achievement, and their post high school aspirations. Every one has looked at number of students; few have been concerned with anything else. The attention to number of students as related to rate or amount of adoption has produced correlations ranging from -.40 to plus .40.

And, finally, in attempting to account for variation in adoption among school systems by looking at characteristics of the adopting unit, some researchers, notably those associated with Mort, have examined community characteristics (Ross, 1958). Actually a good deal of work has been done on this dimension. The major findings are that communities characterized by a highly educated population, and by a work force engaged in occupations requiring a high level of education, have a school system serving them which adopts educational innovations either in large numbers or at an early rate or both.

In regard to the conduct of the research on the relationship of characteristics of the adopting unit and rates of adoption, three items seem noteworthy: Most of the correlations produced have been simple correlations. A factor analysis was achieved on much of the Mort research as early as 1952 (Ross, 1958), which is noteworthy if for no other reason than that it was done before the computer age. And the first use in diffusion studies of analysis of variance and covariance occurred in the educational tradition of that research. Mort and Cornell used these statistical techniques in reporting findings in 1941. Cornell was an early adopter of statistical techniques.

5. COMMUNICATION CHANNELS

Moving next to channels of communication as related to adoption and diffusion studies, it seems to me to be extremely important to note that a large difference exists between what can be called adoption studies vs. diffusion studies. This is the case even though adoption and diffusion are frequently used interchangeably. In my view adoption studies deal with who adopts and at what rate. Studies of educational innovations have been, by and large, adoption studies. As you have seen adoption studies attempt to account for varying rates of adoption as well as varying amounts of adoption among school systems. Diffusion studies can take two forms inasmuch as diffusion can have two meanings. On the one hand diffusion can be taken to mean a product, on the other hand, it can refer to a process.

Taking diffusion to mean a product, one is then interested in the extent to which and the rate at which an innovation spreads from its source to and among potential adopters. Those doing research on educational innovations have addressed the diffusion phenomenon from the product point of view. Such research has produced the too often repeated assertion that it takes fifty years for an educational innovation to become completely diffused, that is, used by all potential adopters. Beyond this, it has been found that different innovations diffuse at different rates. Such findings, however, are virtually useless and will remain so until some typologies of educational innovations are generated which yield an understanding of why innovations vary in their diffusion rates. This is a problem to which earlier reference has been made.

When diffusion is viewed as a process as opposed to a product, the central question becomes how does an innovation spread from its source to and among potential adopters. On the matter of how innovations spread, the literature on educational innovations is rather silent. It is the lack of attention to how innovations spread that prompts me to classify the work on educational innovations as adoption studies.

Communication plays a different role in adoption vs. diffusion studies. If one is concerned with who adopts and at what rate, it is desirable to know how communication acts and processes are related because communication is necessary for adoption to take place. If, on the other hand, one wants to know how an innovation spreads, one is inescapably involved in the study of communication processes. Communication is involved in both adoption and diffusion of innovations, but it is far more central to the study of diffusion than it is to the study of adoption.

Communication has been neglected in adoption studies of educational innovations. Attempts to understand how various modes of communication are related to rates and amount of adoption have been few. The research has shown that the extent to which one seeks information outside his immediate geographical area is related to rate of adoption and a couple of studies have pursued the notion of opinion leadership and its bearing on rates of adoption. But overall the neglect of communication is rather awesome.

Inasmuch as those doing research on educational innovations have been conducting _adoption_ studies in which the school system is seen as the adopting unit, the lack of attention to communication is rather understandable. One reason for the neglect is the fact that the studies are _adoption_ rather than _diffusion_ studies, and communication, as indicated above, is more central to the latter type of study. In addition, it is not, strictly speaking, until one is concerned with individual adopters that the questions pertaining to various uses of channels of communication become meaningful. School systems do not send, receive, nor fall under the influence of communications; only people do. As long as the school system is taken as the adopting unit and until attention is given to who plays what part within a school system in the adoption decision, the neglect of the part played by communication will continue and a large gap in knowledge will continue to exist.

6. SOCIAL STRUCTURE

Communication and social structure (another element in the definition of diffusion) are closely linked. What ties them together is the fact that social structure influences communication patterns. Ideally, a diffusion or adoption study classifies individuals according to their place in the social structure--that is, according to their relationships with other people. What we need to know is when this kind of differential placement in the social structure is related to differential access to, or acceptance of, influence stemming from outside the group, regardless of whether the channel of influence is a professional journal or a book salesman. Then, we want to know whether differential placement in relationship to others has something to do with passing on, or reinforcing, information concerning the innovation.

As with communication, social structure has been neglected in studies of educational innovations. The reasons are largely the same: the school system has been taken as the adopting unit and social structure deals not with relationships among school systems but with relationships among people.

One study involved social structure as an explanatory variable both in terms of adoption and diffusion (Carlson, 1965). It was based on the assumption that the school superintendent is the key figure in the adoption process in a school system and the variable of position in social structure focused on the superintendent's position in the social structure of other superintendents in a geographical area.

In terms of adoption, this study indicated that those superintendents who were highly involved in the social network and those who had high status were early adopters. In terms of diffusion, this study attempted to reveal the social itinerary of modern math. It examined the spread of modern math in one county as related to sociometric patterns or friendship choices among the school superintendents in the county. The study indicated that adoption of modern math, either simultaneously or in consecutive years, occurred more frequently among superintendents linked together by friendship choices than what might have been expected to occur by chance. The study also indicated that modern math diffused from a central core of superintendents who were closely linked together by friendship choices to the other superintendents at a rate proportional to their sociometric distance from the central core of men.

Other findings about the bearing of social structure on adoption and diffusion of educational innovation do not exist.

7. SYSTEM OF VALUES OR CULTURE

After having considered the acceptance, over time of some specific item, by individuals or other adopting unit, linked to specific channels of communication, and to a social structure we come finally to a consideration of values. Central to the concern for values or culture is the idea of compatibility or fit between the culture of a group or personality and the elements of the innovation. As far as the compatibility of educational innovations with the culture of a group or personality is concerned, we draw a blank, inasmuch as no researcher has drawn upon culture or values to aid in accounting for the spread of educational innovations or rates of adoption. Several good examples of such research do exist, however. Saxon Graham (1956) has sought to explain the differential penetration of television and other leisure-time innovations among middle and working classes in terms of the hospitality offered by the different sets of values of the two classes.

Rather loosely related to the matter of value systems and culture is the work by the Mort group (Mort and Cornell, 1941) on community characteristics which was mentioned earlier. Also in loose relationship to the notion of value systems are some of the studies by the Mort group dealing with what they call regionalism. In these studies by Barrington (1953), Cocking (1951), and Mort and Cornell the question was: Is there differential spread of selected innovations in various regions of a state or the nation? The answer was yes. No attempt was made, however, to account for the regional difference in terms of value systems.

SUMMARY

In this paper I have tried to provide a general summary of the research on the adoption and diffusion of educational innovations. Also, I have tried to present an overview of the basic elements of the process of diffusion and to indicate within this framework what is known and where the research has fallen short of the mark. I have placed more emphasis on the deficiencies of the research than I have on the results. This was done because of what I consider to be the magnitude of the deficiencies. Deficiencies noted include: (1) large variation in the meaning of acceptance of an innovation, (2) inadequate documentation of the fact of acceptance of an innovation, (3) insufficient attention paid to time of adoption, (4) failure to carefully identify the essential elements of an innovation and test whether or not all essential elements were present in scoring an adoption, and (5) the absence of a classification scheme of innovations which would permit comparisons of what now exist as discrete studies.

In addition I have noted in the research literature a lack of concern with organizational theory even though users of educational innovations are either part of complex organizations or are complex organizations. Furthermore, extremely limited attention has been given to the roles of communication, social structure, and value systems in research on educational innovations.

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NEEDED RESEARCH ON RESEARCH UTILIZATION

by

Ronald Lippitt and Ronald Havelock

This paper focuses on pivotal issues for research in two areas of the research utilization process. In Part I, Ronald Lippitt focuses attention on the internal conditions needed if knowledge is to be utilized--the processes of linkage within the adoption or utilization unit, i.e., linkages between the reception of the utilization-opportunity and the actual use-in-action of the new inputs.

In Part II, Ronald Havelock analyses the area of external conditions which faciliate or prevent the new knowledge resources from reaching the potential user. The two parts complement each other in focusing on what we regard as the two over-all areas for priority inquiries.

PART I: THE PROCESS OF INTERNAL LINKAGE IN RESEARCH UTILIZATION*

There are linkages in the typical, research utilization process having to do with the connection between the production of a piece of knowledge (new data or a theory or a method, or even a new practice) and its adoption and utilization by relevant users. I want to focus on just that part of the linking process which happens inside the knowledge consumption unit--a person or group or organization.

Let me start by identifying briefly some of the process elements within the person, or within any adoption unit, which may pose problems in the consumption and utilization of new knowledge:

1. First, there is commitment to the belief or value that there are resources outside the self which are relevant to the solving of current problems.

2. The individual, or unit, has a self-evaluation or self-conception, that accepts as

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*By Dr. Lippett

legitimate (and even as desirable) the search for and the use of resources outside the self.

3. There is an awareness of a discrepancy between one's aspired performance and present performance, and a desire for improvement.

4. There is an awareness of and a cognitive understanding of a bit of new knowledge (that is, a new concept, research generalization, model, method or whatever it may be) and an acceptance of this bit of new knowledge as valid.

5. There is a perception of some implications of that new knowledge relevant to one's own problem-solving need.

6. There is recognition of one or more alternative ways in which these implications can be actively and personally used.

7. There is a commitment to risk trying to use these implications in one's own performance (and I emphasize the word, risk).

8. There is a value judgment which results in one of the alternatives being preferred.

9. There is legitimization of ambivalence and resistance within the self to the utilization effort.

10. There is a projection of a plan of some kind, or an intention to make a try of some kind.

11. There is mobilization of the skills or resources necessary for a successful try-effort.

12. There is some type of actual try-effort.

13. There is a judgment of success of failure, so that decisions can be made about whether or not to continue the effort after the try.

What questions are generated by our efforts to understand these aspects of knowledge utilization? What are the research challenges of getting a better understanding and control of these internal aspects of the knowledge consumption process? The critical nature of this phase of voluntary internal consumption of knowledge is well illustrated by a conference I had the other night with a group of student Black-Power advocates in a high school in Washington, D.C. One very thoughtful and assertive young man said, "I can't see why they don't give us more say about what goes on around here. Don't they know that not a one of us has to learn anything from them?"

In our enthusiasm to get new knowledge and techniques used by others, we forget often that our eagerness and our perception of the relevance may not be shared by our adoption target--that is, the teachers, the administrators, the other educational personnel who are the focus for our knowledge utilization efforts.

The questions I'd like to focus on are these:

1. What are the entry conditions that help to link the potential knowledge consumer to an external knowledge resource?

2. In what ways can new knowledge be presented so that it is received and perceived as relevant?

3. What type of interaction with the new knowledge, and with its source, supports the

exploration, incorporation and, adaptation of the new knowledge?

4. What process of interaction with the new knowledge results (a) in linking the knowledge to commitments to try and (b) in connections between commitments to try and actual utilization in output?

5. What are the conditions of try-out that support the successful adaptation effort and support the maintenance of that effort after a first try?

I'm going to focus primarily here on the person as the utilizer of new knowledge but the same type of analysis can be made with the focus on groups as the adoption units.

ENTRY CONDITIONS

Let's start with a few observations about bringing about a connection between resources and potential users. We can identify three patterns of connections:

ONE, is that the potential adopter or consumer has a need for improvement or change and initiates some kind of scanning or retrieval effort, searching for and trying to locate needed resources.

A SECOND, rather different pattern occurs when a would-be dissemination agent initiates efforts to communicate resources of knowledge which he believes are relevant to the target person.

THE THIRD pattern is one in which a third party, acting as the referral or linking agent, initiates or supports efforts to get relevant knowledge resources (as perceived by him) linked to potential consumers.

Initiative-Taking by Potential User

Let's take a closer look at the first type, the process of initiative-taking by the potential adopter. A sense of pain or a sense of a problem does not necessarily lead to active or appropriate search efforts for the necessary knowledge. Several processes here need experimental study. What kinds of educational inputs such as training and demonstrations will legitimize asking for help? We find in our interviews with teachers, for example, that there is a great inhibition in asking for help from potential resource persons. What kind of skill training will most effectively help potential knowledge-utilizers to formulate appropriate search questions? A great deal is being said in new curriculum work about the need for training in inquiry methods. This is a basic problem for us, too, in working with teachers or administrators.

There will probably be very limited use, for example, of such resources as ERIC by practitioners until research is done on the appropriate training of the help-seekers. One hypothesis that we are currently exploring is that search becomes more focused and more motivated if the inquiry formulation starts, not by having the teacher or administrator or whoever it may be focus on the pain his problem gives him, but instead by having him focus on projecting a desired state of affairs into the future. In recent work with administrators, we have had them envision themselves one or two years in the future, observing the things that they are currently doing which would please them two years hence. This seems to lead to a more adequate crystalization and focusing of goals rather than focus on "what I want to get away from" in terms of the pain. It's a clear focus on "where I want to go," instead of what I want to escape from.

The initiative taken by the problem-solver to retrieve what appears to be relevant knowledge may still lead to great frustration because of inadequate organization of this knowledge and the lack of help in converting the input from the computer, or from the consultant, into relevant usable help. This is one of the most critical process issues of utilization. Knowing "what they found" or "what they did" is usually not enough to support significant consumption or utilization.

Initiative by Change Agent

Let's turn to the second case, where the initiative comes from the change agent. We might label this the "decade of outreach efforts" in social and educational practice. We suddenly discovered that new opportunities for work and recreation do not necessarily reduce delinquency; that more access to contraceptives does not always increase their utilization; that an explosion of Title III innovations does not result in spread and use of them by others.

Most of the significant new research and development inputs in education represent confrontations with existing values and attitudes we hold. They challenge the satisfactions we have with our current process, and the skills we have mastered as practitioners. Therefore, new knowledge needs to be introduced through interaction with trusted resource persons, and in a climate of non-threatening support. Examining the skills required for taking outreach initiative and learning how to support exploration on a "not-playing-for-keeps" basis are crucial areas for research.

Some of the new developmental efforts at providing teachers and administrators with micro-experiences of what it might be like if they were to adopt (but without committing themselves) deserve close examination.

Third Party Linkage

The case of linkage by a third party is very important for us. Because of greater problems of distrust and defensiveness in educational change as compared to agriculture, medicine, industrial technology, the sanctioning validation by a trusted peer insider is one of the most crucial aspects of entry. This has led to the concept of "the temporary system" of the inside-outside team, a major innovation in change strategy. One of the key issues, when cooperating with insiders as linkers to others in the school system, is the issue of the risk taken by the insiders in being seen by other insiders as the sanctioners and supporters of outsiders.

A critical focus for inquiry is the delineation of the appropriate role for the insider as linker, in introducing outside innovation carriers to the system, without losing his membership and status in that system. In a number of school systems where dissemination efforts are underway to introduce research and development mechanisms into the school building, and where in each case there are insiders in the building as key members, it has become very critical to work through with the insider the issues of handling his role--the role of being connected with and loyal to the outside and the inside at the same time.

I'd like to focus on one other aspect of the entry situation before going on to what we've called the "image of potentiality" issue. It could be illustrated by a conversation last week with the dean of a large school of education. We were planning with him appropriate ways to help initiate new models of classroom teaching in the undergraduate pre-service teaching training programs in that school of education. The dean said,

> Well, it will have to be voluntary. But only a few are likely to volunteer. If more of them could see concretely what the results might be, a lot more probably would volunteer.

In agriculture it is easy to see the improved crop by visiting the demonstration farm, or in industry we can see rather concretely the higher productivity, or in medicine we can see the faster drop of temperature with a new drug. Such clear payoff data are not easily available to give images of potentiality to would-be adopters of new educational practices.

We decided with this particular dean to try four approaches, i.e., to manipulate four types of variables on which we badly need experimental work. First of all, we decided to use a trusted informant from another school of education to share his own experimentation and results. Second, to give guided observation of a micro-demonstration of new classroom teaching practices. Third, to provide each member of the faculty as part of a faculty meeting--not as a special invitation affair--with a micro-experience in a role as learner, comparing experiences across several different innovative teaching methodologies. Fourth, to give a limited trial opportunity to volunteers without any commitment. We need a major focus on the engineering of appropriate stimulation of images of potentiality and opportunities for testing without final commitment.

THE INTERNAL PROCESS AFTER ENTRY

But, after entry, after awareness has been established, then what? So far I've been talking only about connections that would open up the opportunity.

During the past two years of our analysis of the utilization of educational innovations, we've been led more and more into examination of the internal processes within the person which determine whether there will be real behavioral tryouts, real application efforts, whether these tryouts will be successful and whether there will be creative adaptation and maintenance rather than giving up after the tries. There is growing evidence that cognitive knowledge, intention and plan do not predict action or success. Morse and others (1961), for example, found no correlation between teachers' statements of philosophy of teaching and their intentions on one hand and their actual observed classroom behavior on the other.

Rehearsal in Anticipation

In one current experiment, we're disseminating a conceptual and behavioral model through a package of materials (records for the record player, etc.). The model deals with a diagnosis of the negative circular process of rejection between teenagers and adults. We're comparing the effect of three dissemination events in using these materials with practitioners.

One variation carries the learners through a rather complete and tested cognitive presentation of the materials, and the experience with retrieving the materials. The second variation carries them through a less complete cognitive presentation, but carries them through planning their first use of the materials as a trainer. The third variation carries them through cognitive presentation, plus their plan, plus anticipatory role-playing practice of their first effort at utilization. It is our hypothesis that anticipatory rehearsal is the most crucial variable in linking intention to action.

Inside-Outside Support Needed

In another project we are disseminating action research methodology to school building teams. Our tentative conclusions from this research includes two generalizations.

ONE is that entering into commitment to action seems feasible to the person to the degree that he feels he is part of a team whose members develop

(1) trust in each other, and (2) joint commitment to action and to support of each other. It seems clear in this kind of innovation that the individual alone is certainly not an appropriate unit of adoption.

THE SECOND generalization is that the adopting unit most needs outside support at the point of greatest risk taking. Entry into the change effort role in the initial tryout situation is the greatest point of risk; it is not in a pre-service summer institute, but at the time of the first class session, when first trying to get colleagues involved, or when first trying to practice what he has learned. A crucial research focus, then, is to discover what types of support for adoption effort are needed for what types of innovations in what types of social contexts. For example, if the innovation will disrupt or threaten students or colleagues, more support will be needed; this is also true if the adoption requires a high degree of behavioral change of the adopter. Or, (and this one we've become particularly interested in) if giving up the attempt is going to be easy, if it's going to be easy to develop the rationalization that the idea doesn't work--that it isn't true in "my" situation, then more adoption process support is needed.

Brim's adoption behavior research (Brim, 1954), which compared those who committed but never tried, those who tried and then gave up, and those who tried and maintained, is an important type of research model. He found, for example,--and these were mothers adopting a new behavior pattern of feeding in relation to their four-year-old children--that prestige of the change agent (in this case an M.D.) related to try versus not to try. Prestige did not relate at all to the mothers' maintaining their new behavior patterns. He found that perceived support of husband related to maintaining, but not to initial try. He found that favorable feedback from the child (of the new behavior) related to maintenance but not to try.

Self-Resistance: A Legitimate Problem

Another critical variable among the internal conditions for knowledge utilization is that of acceptance of internal resistance as a legitimate problem-solving issue. The potential adopter needs to accept that resistance with himself is a natural, understandable and acceptable thing, as he considers any new potential materials or behavior patterns.

Recently, a group of school administrators were working on techniques for coping with some of the role pressures to which they were subjected. After working a day on a preferred alternative for coping with such pressures, developing action plans, and making commitments to each other, they then analyzed the factors for and against the probability that they would really ever actualize any of their commitments. One of the administrators broke the silence after working for awhile by jumping up and saying, "Well, this is the first time I've felt honest in my life!" The breakthrough was legitimizing the notion among themselves that they had to cope with factors within themselves as to whether or not they really would do all these things they were committing themselves to. It was a major turning point of that conference.

In a program of work with a national organization, conducting regional research utilization workshops we discovered a great deal of resistance to deriving action implications from data. When we began to add some human relations sensitivity training sessions as part of the design, we began to find (1) some breakthroughs in facing the problem of resistance to scientists, (2) changes in the rejection of the relevance of the research done elsewhere (which was an easy resistance), (3) lowered resistance to sharing of problems and sharing of needs for help, and (4) an increase in readiness to perceive their own behavior as a part of the problem. So, a critical area for research is not only to discover the most effective ways for working on the substantive task of using new ideas, but also to inquire into the personal and group interrelationship processes.

Those of us involved in dissemination efforts are sometimes inclined to label as resistance to change a natural need of the potential adopter to question the relevance of an innovation to himself and to his own situation. He questions the relevance of the knowledge and models of action that are generated in other situations and have been used successfully by other consumers. Usually dissemination agents do an inadequate job of helping the potential adopter explore realistically the question: "Well, how would this fit in my situation?" "Why would this innovation particularly fit my needs, fit our situation in our building, in our school system?"

Some Needed Research

There seem to be several types of research needed here. For example, there is need to work on how to support self inquiry into one's own needs, to create sensitivity to issues of relevance and to what others have done, to develop precommitment tryout periods, to work on the derivation or adaptation process.

In a recent research derivation laboratory with a national organization the staff had decided on two retrieval problems. One was alienation between adults and youth, and the other was the installation of research and development procedures in the organization. Two literature review papers were prepared and read ahead of time summarizing research generalizations.

During the first day of the conference, there was very painful work done on "implications for us of any of these generalizations." The participants made the discovery rather quickly that they tended to free-associate from data rather than to be able to derive real implications. After they had done the work on implications, they were helped to brainstorm alternatives, then to move into the value issues of choosing preferred alternatives, and finally to work on developmental plans. That was 12 months ago and many of the developmental projects that came out of the derivation conference are active, including one that included recommendations to do away with the National Research Department, and put in a research and development division with triple the budget in the office of the director.

Two Final Points

There are two final points to focus on. One is the prevention of becoming a sucker for change; and the other, making adoption a high quality tryout.

The fadism of change is just as much a danger for education as the resistance to new developments. There was a teacher who said the other day, "Well, in the fall we have to answer the question what new things are you going to be doing this year. Luckily the question fades by November."

Klein's paper on the defender role (Klein, 1967) has made very clearly the point that much of the defense of potential adopters is, in reality, problem solving rather than resistance. For example, we have helped quite a number of teachers to look at the question: What are the factors for and against my trying to do anything new in my class this year? By legitimizing that analysis typically we find that the factors they feel are pushing them toward adoption are factors like the expectations of administration, the self concept of one's professional role, or being in on a Title III project they've got this year. There is very little, if any, image of personal need for change in coping with problems on the job. And until that becomes a significant motivation, the chances for payoff from adoption are relatively small. So, there is great need for help from potential adopters in articulating personal needs for change. They need help in analysis of the criteria for adoption decisions.

We've had some very exciting times involving groups of teachers, administrators and social scientists in developing rating scales for comparative evaluation of available innovations. They create scales like: "relevance to learning needs, feasibility in terms of their own skill level, resources that are available, the readiness of the students to respond positively."

The final point is that a large portion of diffusion effort fails in education because the first tries by the teacher, administrator and other adopters are unsuccessful. We are in need of research on the phenomena of supporting successful first tries. From our observation, four variables are very prominent in the failure experience.

One is the typical lack of preparatory development of the competence to try before really trying. Second is the great ambivalence about the desirability of trying, leading to motivated failure as an excuse to give up. This is very frequent, and relatively unconscious. Third is the lack of support at the critical risk period--already referred to. And fourth is the lack of guiding feedback to support continuity of effort and to guide revision of effort.

The critical point is to help adopters define the criteria of progress so that they will get some sense of success from small steps of improvement rather than being dissatisfied or frustrated if Heaven hasn't come in one bound in their efforts to adopt. In fact, it's become quite crucial in some of our work with teachers for them to see that one criterion of progress is that things for awhile may get worse before they get better, and to use this feedback as support for their continuity of effort. So, critical research is needed on the transition from plan to try.

Well, there certainly are more issues around the internal conditions for utilization that we could explore with more time. This is a sample, I think, of some of the critical ones which determine whether anything will really happen after the diffusion process has successfully carried the new knowledge to the point of attention of the potential adopter.

PART II: THE EXTERNAL PROCESS: ROLES, ORGANIZATIONS AND SYSTEMS FOR KNOWLEDGE LINKING*

As we have seen, if we focus our concern on what goes on inside the consumer, we are going to find many barriers to effective utilization, but we should not forget that the individual consumer of knowledge does not live in a world of his own. On the contrary, he is served by a social system, a vast network of individuals and groups, which inhibits, filters, and facilitates the flow of knowledge to him. Let us turn, then, to consider what is known and what is needed in research on this social context of knowledge utilization, the world outside the skin of the user.

There are four major aspects of this social system to which I want to refer in my remarks and I will label these as, first, the linking person or linking role; second, the linking organization; third, the temporary linking system, and finally, the permanent linking system. These four aspects or levels are illustrated in a very simplified way in Figure 1.

With reference to this diagram, let me summarize these four levels very briefly before I go into each of them in greater detail.

THE LINKING ROLE. The first level we want to look at is the level of the linking role. Earlier we suggested that there may be critical individuals who can be termed "change agents," who are outside the consuming system, and that there might be other

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*By Dr. Havelock.

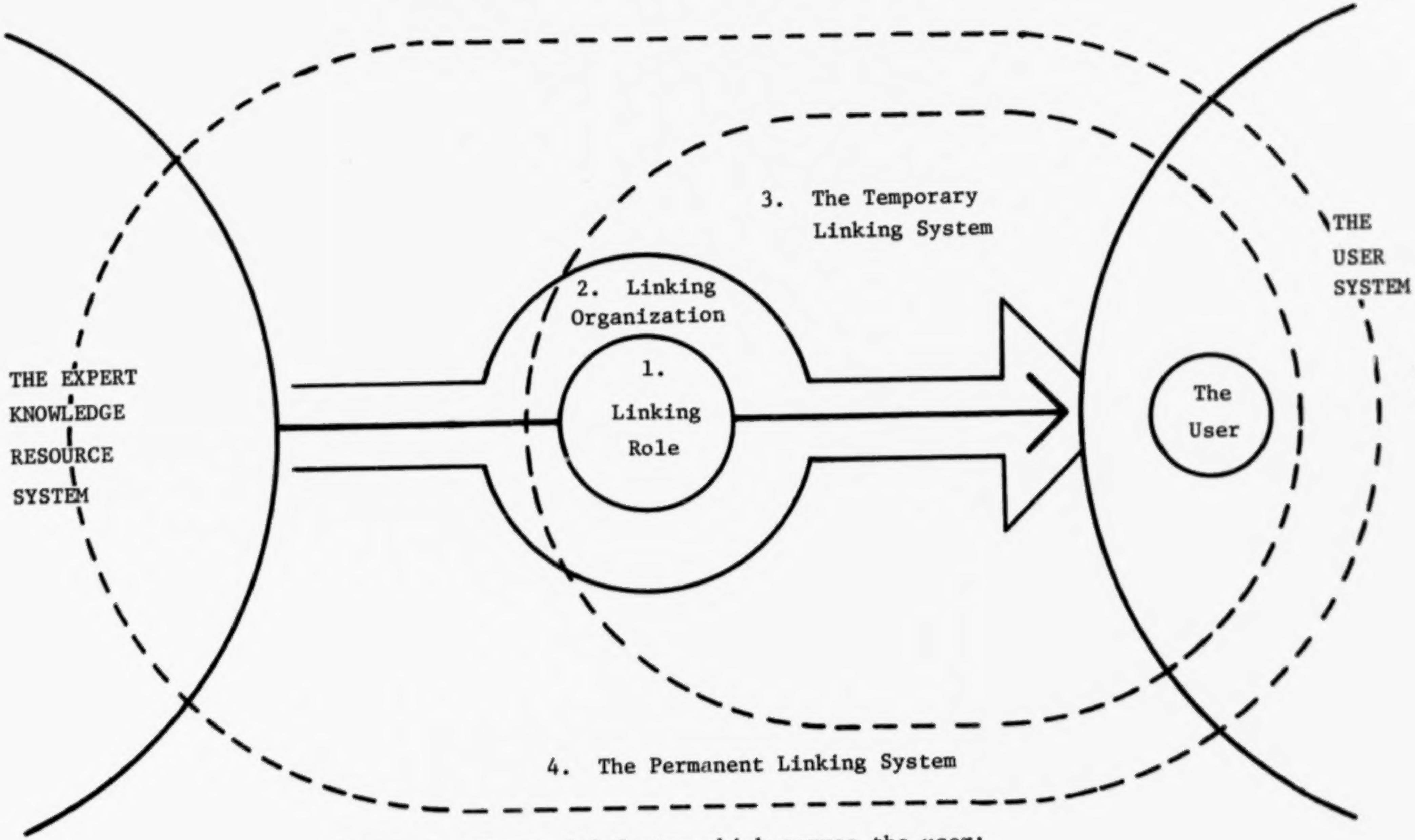
THE EXPERT
KNOWLEDGE
RESOURCE
SYSTEM
2. Linking
Organization
1.
Linking
Role
3. The Temporary
Linking System
THE
USER
SYSTEM
The
User
4. The Permanent Linking System

FIGURE I: The Social System which serves the user: Four Levels of Analysis.

critical individuals inside. I think that we are gradually moving toward a conception of a linking role, or a knowledge linking role, a defined position within our social system which can be filled by a variety of individuals, but which maintains a link between potential consumers and expert resources, and does this self-consciously and perhaps even on a full time basis.

On the right in the diagram we have depicted the user or consumer of knowledge (it might be an individual or a system or a school) and on the left we have what could be called an expert resource system (it might be the university, the research community, etc.); then between these, getting knowledge to the consumer, we might find beginning to emerge (more and more in the last few years) a particular kind of individual whom we might designate as a knowledge linker or a person who holds a knowledge linking role.*

THE LINKING ORGANIZATION. The second level I want to discuss is the linking organization, the institution or special group in which we might find a number of linking roles; it is an organization specifically set up to effect knowledge utilization, so that we may have, again, a variety of individuals formed into one organization which serves as a combine and in effect serves the same purpose as the individual knowledge linker.

TEMPORARY SYSTEM: The third level I want to talk about is what Miles (1964) and others (e.g.,

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*For an elaboration of this concept and a review of pertinent literature, see Havelock (1968).

Watson, 1967) have called "temporary systems." "Temporary system" is a useful designation for the specific project or arrangement into which utilization events and activities are organized, a group which comes into existence to accomplish a specific act such as a training exercise or a seminar, and terminates its existence once that act or that event has taken place. These temporary systems are actually the mechanism through which real communication and knowledge transfer take place.

PERMANENT LINKING SYSTEM. Finally, I want to discuss what I want to call the "permanent linking system," the social system which includes the consumer, the linking organization (including its various linking roles) and the temporary systems of knowledge utilization, and also the expert resource systems depicted on the left of the diagram. This fourth, and we might say "broadest" level of discourse takes in the entire range of activities, roles, and institutions which are involved in the transformation of knowledge into practice. And sometimes, by looking at the problem from this broad prospective certain issues emerge which don't emerge when we have a more limited focus on the individual or on the group.

Focus on Both R-And-D

I want to stress in my remarks that we need to have not only research at these four levels, but we need to have research and development. In other words, the focus should not only be simply on describing the utilization process as it is, but it should also be on how it can be improved, how can it be made better. Our research effort should be guided especially by relevance; and by this I mean relevance both for educational concerns of the present or the near future, and also for policy makers and educational planners at all levels.

The major innovations in education in the last decade have, in my opinion, come in the quantity and patterning of federal support. Many decisions have been made and many innovations introduced--particularly those involving institutional or organizational changes, such as, the research and development centers, the regional laboratories, the ERIC clearing houses, etc. We really know very little as yet about the wisdom of these decisions, and we have very little factual scientific information on which to amend these policies or formulate new ones.

I do not want to come to you today with a long catalogue of needed research, but when I think of the many areas in which hard knowledge is lacking, I seem to end up with such a catalogue. Hopefully, however, the four levels of concern which I have chosen will cover the priority areas for the next four to five years.

And let me add, regarding this question of priority, that we've got to realize that there is a very limited set of resources for getting good research on diffusion or utilization. There are very few people who are really capable of doing research in this area or are interested in doing it. Likewise, there is still, and probably will remain, only a small amount of financial support for this kind of activity. And, of that small amount, federal support constitutes a major portion--as in the programs I mentioned earlier. So, from a planning or policy-making point of view, and a cost-effectiveness point of view, we should be concerned with the kind of study that is most important. The emphasis of this kind of study should not be on an overall theoretical standpoint nor on full understanding of knowledge utilization; but rather on really needed research that will have material payoff for our society within this intervening period. I'm optimistic that another Great Society will come along some day to provide the massive financial support for research on the diffusion process that I can see is needed, and I will be glad to get together with anyone to plan that great spending program for such research.

RESEARCH ON THE LINKING ROLE

Let us go, then, to the first level that I described as an area where research is needed, that of the *linking role*. There are here three areas in which we need to focus some attention. The first area is: What is the linking role? The second: Where should the linking role be located? And finally: How can the role be made most effective?

FIRST, then, we want to ask the question, what is the role? And here we need to build on a considerable amount of work that has already been done, work that is primarily conceptual analysis which has defined various functions of knowledge linking. For example, we are beginning to emerge with a taxonomy of linking roles. From the work that has been done by Clark and Guba (1965), Clark and Hopkins (1966), Charles Jung (1967a), Havelock (1967; 1968), and others we have some ideas of what is involved in the way of distinct and separable functions in dissemination.

In a symposium a year ago (Jung, 1967b), we compared the *"consultant"* role and the knowledge *"conveyor"* role. These are an example of meaningful distinctions among functions about which researchers are beginning to agree. So the categories, the types of linking, the functions, are becoming clear from such work. What we need now, are empirical studies to find out what the relative frequency of these various linking roles or linking role functions are in education; and we need to get a better understanding of what roles are *least recognized* and also what roles are *most important* among those that have been identified. And finally, we need to know what sort of division of labor among "knowledge linkers" is the most successful or the most viable.

SECONDLY, we need to have a better understanding of where the linking role should be, that is, how should the linking role be institutionalized? We have already raised the question of *inside versus outside*. Do knowledge linkers work most effectively if they are part of the consumer system; or do they work better *outside* it? I don't think we have definitive studies on this question. We also need to know whether these roles should be university based or non-university based; that is, should they be tied to what we might call the *expert system*, represented by the university, or do they fare better if they are somehow positioned between the university and the school system or the school setting? Finally, under this question of where the role should be, we might compare the commercial versus the governmental and versus other kinds of institutional bases for the role. Do commercial change agents work more effectively than those in government; or what is the proper combination?

THIRDLY, under the question of role, I want to suggest that we need to concern ourselves with how to make the linking role better; and by better, I mean more permanent and more viable and also more successful. We could describe four kinds of things, in general, that we need to have to bring about a successful knowledge linking role.

The first might be a better understanding by individuals filling the role of what the role means, i.e., what are the role expectations and what are the role requirements? Secondly, those who hold knowledge linking roles need a better understanding of what the process of knowledge linking is and what the process of change is. Thirdly, they need more efficient and effective access to knowledge sources. And finally, they need a better understanding of how they should organize and invest their time and energy.

Support for Knowledge Linkers

Now, to fulfill themselves in these four directions (i.e., in terms of role requirements, understanding of process, access to resources, and time allocation) knowledge linkers are going to need various kinds of what we might call software and hardware supports. Here what is needed is more *development than research*. There are certain kinds of things that need to be produced, and produced by people who are skilled in research and development. I might suggest five kinds of things that are needed to support these knowledge linking roles:

FIRST of all, there is a need for handbooks and manuals, perhaps along the lines of the field manuals used by county agents in agriculture. But in any case we need to have handbooks about the knowledge utilization process that will be handy reference tools for people on how to bring about change, how to introduce new ideas to the school system, and how to induce a spirit of innovativeness and eagerness for new ideas in the potential consumer. There are, of course, a few such books around. I think the one by Lippitt, Watson and Westley on the Dynamics of Planned Change (1958) is often cited by people who work in the field as a useful document, but we need others; perhaps more specifically geared to the question of knowledge utilization.

SECONDLY, in connection with this, I think we need to develop new types of diagnostic tools: self-administered questionnaires, checklists, and inventories which can enable the knowledge linker to better define the situation in which he finds himself or can enable him and the consumer to arrive at more adequate diagnoses of what problems.

THE THIRD AREA in which development work is needed is improved mechanisms to retrieve new knowledge. This is the area in which I think we should see the ERIC system moving, i.e., in developing better mechanisms for retrieval of knowledge, and translation of knowledge for practice.

FOURTH, we need to have the development of training and skill building programs for linkers, e.g., summer institutes and courses in the school of education curriculum. And finally, we need to have a greater understanding of the organizational settings which are most supportive of linking roles, which takes us into the second area of concern where research is needed, i.e., research of linking organizations, the organizations in which linking roles are situated.

RESEARCH ON LINKING ORGANIZATIONS

Up to now we have had an inadequate degree of research on the really blossoming series of organizational forms, many of them coming out of federal legislation: the research and development centers, regional laboratories, Title III centers, etc. We also have some in the private sector, organizations such as General Learning Corporation, the Kettering supported centers, and university based centers such as my own, CRUSK, and Indiana's National Institute for the Study of Educational Change.

We need to have comparative studies which indicate which among these various forms of organization for inducing change are most effective. The dimensions that could be observed here include the question of whether they are on the local, state, or federal level. They could confirm whether such organizations are more successful if they are university based, or non-university based, whether they are public or private, whether they are automomonous or linked to parent institutions (thereby having a degree of accountability to those parent institutions).

These linking organizations are also widely disparate on such significant dimensions as geographical focus and content and functional emphasis. It seems reasonable to suppose, for example, that a center which is committed to serving a particular community will have a greater impact on that community than a center which has a general geographic focus; but we don't really know this and we need research to find out whether, in fact, such assumptions are true. Within this group of studies in this area of concern, we need to have better comparative case studies and depth case histories of linking organizations. There are a few beginning to emerge, but I think we need a great many more of these.

Need to Study Coordination

We also need to have studies of the various efforts to coordinate activities within such organizations. I think *coordination* here might be a key research concept in dealing with institutional forms of knowledge linking. Presumably the basic reasons for having a linking organization rather than a linking individual acting alone is to pool resources, to bring people together, to coordinate their efforts so that more can be accomplished. We need to look at at least three kinds of coordination: internal, external-to-resources, and external-to-clients.

First of all, internally: How can we pool the efforts of, let us say, the retrieval specialist and the researcher within these linking organizations, and how can we put these people together with those who have the responsibility of disseminating new knowledge or consulting with local systems. I certainly feel from where I sit in my own center at Michigan that there are many tensions within my organization, certainly tensions between people concerned primarily with action work and people concerned primarily with research, and then people who want to mix the two together in their work. We need to develop a much better understanding of how to really bring these people together, or perhaps we should even ask the question: "Should we bring them together?" Do we need separate teams to do the research and do the action, etc.?

But another kind of coordination that we need to study is the coordination with expert resources outside the linking organization, that is, usually, expert resources in the university. Here, I think, one of the nagging problems in research and development units in industry and also in education would be: how do we get updated to the point where we (teachers) know all that they (researchers) know? Presumably, again, mechanisms such as the ERIC system are designed to bridge this gap. Industry often solves this problem, it seems, by paying enough to attract the best man in the field. I think we need to have studies--comparative studies--in which we can look at systems where this kind of linkage has succeeded and where it has not.

Finally, we need to have a better understanding of how the linking organization achieves coordination with the various client systems, whether they be school systems or schools or individual teachers or administrators.

This question of how to coordinate with the client, brings us to the third level of concern that I want to talk about: the need for research on the temporary system or the *ad hoc* system through which the work of the linking agent or the change agent or the work of the linking organization gets done. We need to make comparative analyses of these series of events into which linkers and linking organizations divide their time and organize their activities. These might be called projects, programs, campaigns, or perhaps just courses, seminars, or conferences. But we need to know what type of temporary systems work best: what *kinds of teams* need to be assembled? Should such teams include insiders and outsiders? What kind of arrangements among the many possibilities seem to be optimal? We need also to ask: What is the proper balance of research, training and action within such systems? How "temporary" should they be? Should they be closed out at a particular point in time, or should they contain within them a more or less continuous *follow-through* capacity?

Still another question we need to ask here is: How large and how inclusive should such teams be? It has been suggested that larger teams are more effective disseminators because more people hear about them. We have models now of very large and inclusive temporary systems such as the Cooperative Project in Educational Development (COPED) of the last few years. We also have examples of smaller types of temporary systems such as traveling seminars, summer workshops, derivation conferences, etc. Many models of temporary systems are mushrooming up and these very much need comparative study.

PERMANENT LINKING SYSTEM

Moving now to the fourth and final level of concern, we need research on what I want to call the macro-system of utilization, the permanent system--the permanent combinations of linking organizations and consumer systems that form what I would like to call the knowledge utilization system as a whole.

We need to ask here what combination of roles are optimal or minimal in such a grand scheme? For example, do we need in education the elaborate bureaucratic structures that we find, let us say, in agricultural extension? What combinations of institutions and institutional involvements seem to be optimal? What kinds of balance between government and non-government or government and commercial involvement need to come into play in the development of such a large utilization system?

We need also to focus on what can be done to simplify, to accelerate and to automate the processes of utilization within such a grand system. Do we need an elaborate system or are there short cuts? One short cut might be found in a focus on the images of future possibilities, as we suggested earlier. Another might be some alternative to the approach where we work methodically through a process of focusing on the pain, then the diagnosis, moving slowly to a definition of possibilities, and finally to innovation.

Finally, we need to look at the goals, not only the goals of the individual or the individual school system, but also within the much broader context. We need to arrive at more adequate definitions not only of "self-actualization" but also of "community actualization" and maybe even "cultural actualization and advancement." I think this is one of the reasons why it is important to think, as we say, "systemically" about the knowledge utilization question. We need to examine and define what we call success or improvement in our total life space or community space. Without these kinds of images of what we'd like to be, it is very difficult for us to look at any individual example of knowledge utilization and say whether or not it was a successful or an unsuccessful effort.

Sometimes resistance to certain kinds of pressures and knowledge inputs is a wise and healthy response; sometimes it is just the reverse. We should not be concerned simply with promoting change or adoption or innovation for their own sake; what we really want is sophisticated consumers who adopt when they should adopt, reject when they should reject, and innovate and adapt when they should innovate and adapt.

This brings us face to face with the question of *values*. An ultimate criterion of effective utilization must be based on shared assumptions about what is "good" and what "ought-to-be," both now and in the future. We need clearer and more concensual images of what we ought to be as a people and where we ought to be headed. This is an arena in which researchers are often loath to work, yet it may be the most challenging and important area for us to explore in the next few years.

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It is our observation at the present time that one of the great tragedies in American education and social practice is that a large proportion of the creative inventions which are in line with good research and theory never become visible and never become appropriately transmitted from one setting and practitioner to another. (Ronald Lippitt, 1965b)

NEEDED RESEARCH ON DIFFUSION WITHIN EDUCATIONAL ORGANIZATIONS

by

Everett M. Rogers and Nemi C. Jain

Diffusion research began in the late 1930's and early 1940's with studies of farmers. These investigations were sponsored by the sources of innovations, agricultural extension services, so as to enable speeding the diffusion of farm innovations. The researchers were originally rural sociologists, and their respondents were mainly farmers, who were asked to recall how they learned about and adopted new ideas.

These beginnings of diffusion research have left an indelible stamp on the approaches, concepts, methods, and assumptions of the field, some 25 years and 1,300 publications later. And often the "biases" that we inherited from our research ancestors have been quite inappropriate for the important diffusion research tasks of today. Strange that the study of innovation has itself been so traditional!

What are two of the most important biases that we diffusion researchers implicitly adopted as a result of our historical past?

First, diffusion research has largely been a tool on the side of *sources*, not *receivers* of innovation diffusion.* How different would our knowledge of diffusion processes be today if the first studies had been sponsored by farmers rather than extension services? Maybe the field would be called something like "innovation-seeking," rather than "diffusion."

Second, because the data were gathered from *individuals* as the units of response, largely via field surveys, our focus has been upon *individual*, intra-personal variables, largely to the exclusion of social structural and organizational variables.* We erroneously assumed that because individuals were the units of response, individuals also had to be the units of analysis. But the point is that teachers do work in organizational settings like schools, even if farmers do not. And the organizational environment does have an important influence on teachers' innovative behavior.

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*The main exception of source-sponsorship of diffusion research is the series of studies under the direction of the late Paul Mort at Columbia University Teachers College, which were funded by organizations of progressive-minded schools.

The first so-called bias (source sponsorship) leads to consideration of the ethical implications of diffusion research (and perhaps of much other social science inquiry); however, this theme is beyond the scope of the present essay. We will deal with one particular consequence of the second bias (the focus on intra-personal variables), and seek to suggest a route to its possible amelioration. This research map will center around needed investigations on the diffusion of new ideas within educational organizations. In this pursuit, we must stray far from the core of most completed diffusion research, and wander (conceptually) into the arena of organizational theory, systems analysis, structural effects, and matrix multiplication. These research approaches have, in the past, largely been considered beyond the pale of conventional diffusion research. One assumption is that there is theoretical profit in bringing such divergent approaches into the diffusion fold, and conversely, in extending the nature of diffusion inquiry to greater attention to structural factors.

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*And also, strangely, to the exclusion of personality variables (such as dogmatism, achievement motivation, etc.) in diffusion and adoption. This is odd only because personality variables are such an important type of intra-personal variables. It probably occurred (1) because diffusion researchers were (and are) mostly sociologists and anthropologists, rather than psychologists or social psychologists; and (2) because personality variables are generally difficult to measure in field (as opposed to laboratory) settings.

The format of this paper consists of discussion (1) of needed methodological approaches to the study of diffusion within organizations, and (2) of potential conceptual emphases.

NEEDED METHODOLOGICAL APPROACHES

We feel we must focus on two different (but related) approaches in studying diffusion in organizational settings: (1) relational analysis, and (2) structural analysis.

Relational Analysis

Professor James Coleman (1955) of Johns Hopkins University sagely called for an overhaul of our entire research attack in sociology, which we feel is even more appropriate in any type of communication research. He urges us to abandon our concern with individuals as units of analysis in favor of relations between individuals as units of analysis. Diffusion processes (and, in a more general sense, all communication processes) are, after all, a series of transfers of messages from sources to receivers. So it is entirely appropriate to utilize relationships, transactions, pairings, chains, etc. as our units of analysis in diffusion inquiry. This focus is on units other than individuals, a unit which Coleman says amounts to a rather poor "aggregate psychology." But very few past diffusion studies followed Coleman's admonition, even those researches conducted in organizational settings.*

Coleman (1955) traces reasons for our overemphasis upon individuals to the neglect of communication relationships. Mainly, he blames survey research methods, which lead to the neglect of social structure and relationships among individuals. "Samples were random, never including (except by accident) two persons who were friends; interviews were with one individual, as an atomistic entity, and responses were coded onto separate IBM cards, one for each person" (Coleman, 1955).

But most recently, some social scientists have come to realize that even with use of survey methods, which are often essential to gathering large-scale amounts of data as a basis for generalization, various techniques of measurement, data-gathering, and data-analysis can be utilized to provide focus on relationships rather than on individuals. And, important for the present paper, these newer methods are especially useful when the research locus is a highly-structured system, like a formal organization.

In short, the measurement devices center around some type of sociometric question, the data-gathering techniques consist of sampling intact groups (or sub-systems) or pairs of individuals (as with so-called "snowball sampling"*), and the data-analysis methods amount to using the dyad, chain, or the sub-system as the unit of analysis.

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*Rogers' content analysis of approximately 1,000 empirical diffusion studies in the Michigan State University Diffusion Documents Center shows only about 50 or 5 percent utilized a dyadic approach, one type of relational analysis.

How might relational analysis be used in diffusion investigations? Three possibilities are (1) dyadic analysis, (2) chain analysis, and (3) clique or sub-system analysis.

DYADIC ANALYSIS of sociometric data about innovation diffusion entails obtaining information from source-receiver pairs. The communication dyad (or two-person interacting pair) may be located by asking a sociometric question like "Who first told you about modern math?" or "Who convinced you to adopt modern math?" Such questions have been widely utilized in past diffusion studies, but not as a basis for forming communication dyads. In one sense, the dyad is the most elemental, primitive unit in interpersonal diffusion. It deserves more research attention.

A variety of important research questions, such as the following, can be answered with such dyadic analysis.

1. To what extent does diffusion oc[illegible] between individuals who are homophilous in their

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*A term used to describe a sampling design in which (1) a random sample of individuals are asked a sociometric question, for example, from whom they obtained information about a new idea; and (2) then the individuals so named are interviewed at a second stage. The snowballing can, of course, be continued to third, fourth, etc. stages.

characteristics, beliefs, and attitudes? Homophily is the degree to which two individuals who interact are similar. There is an implication from past diffusion research that much innovation flow occurs between pairs of individuals who are quite homophilous, although the extent of such homophily seems to depend upon such variables as the traditionalism of the system's norms, the nature of the variables on which homophily is measured (such as social status, innovativeness, etc.), and the nature of the innovation.*

2. When some heterophily (the opposite of homophily) does occur, do receivers seek sources (pairwise) who are higher or lower in social status, innovativeness, technical competence, etc.? In other words, is there a "trickle-down" or a "trickle-up" of innovation in a social system? What characteristics of the system, the individuals, or the innovations determine whether these heterophilous communication patterns are upward or downward bound?

CHAIN ANALYSIS is essentially similar to dyadic analysis in respect to its dependence upon sociometric data, but differs in that multiple-person communication chains are the units of analysis, rather than dyadic pairs. A communication chain consists of any number of individuals in a system, starting with a source person and sequentially continuing through all the related individuals who are his direct or indirect receivers. Essentially, chain analysis consists of a number of linked dyads in which the receiver in one dyad is the source in the next. Statistical methods for the complete analysis of chains are not yet well developed, and most diffusion chains are now analyzed via diagramatic plotting and visual inspection. Matrix multiplication by computer provides one means of statistical chain analysis.

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*For instance, we would expect to find a high degree of social status homophily in the diffusion of an innovation that was only appropriate for high status members of a social system. Those of high status would interact mainly with others of high status about the innovation.

CLIQUE OR SUB-SYSTEM ANALYSIS consists of sociometrically determining the communication groupings among the members of a social system. Such clique identification may be accomplished via the visual plotting of sociometric data unless the number of individuals involved is numerous and/or the interpersonal relationships are complex. In these cases, one should resort to the matrix multiplication procedures suggested by Hubell (1965) or Festinger (1949). Essentially, these techniques consist of reducing the sociometric data about diffusion to a "who-to-whom" matrix in which the source individuals are located on one dimension of the matrix and the receivers on the other. The matrix is squared, then cubed, etc., usually by computer techniques. Through this procedure, existence of diffusion cliques soon becomes apparent within the total system. Such informal communication cliques can be then compared with the formal organization of the system in order to determine how well the formal structure predicts or explains actual diffusion patterns.

Further, matrix multiplication locates (on the diagonal of the matrix with successive self-multiplication) the "liaison" individuals who link two or more cliques (if such linkage occurs in a system). One may then proceed to determine the characteristics of these liaison persons, who act as "diffusion gatekeepers."*

STRUCTURAL EFFECTS AS SYSTEM VARIABLES

An obvious reason for our scientific interest in social structure is that it has an important influence on individual behavior, including the adoption of new ideas. Yet past diffusion inquiry seems to have implicitly assumed that such structural effects are not worth much study. More recently, however, a couple of investigations suggest that such structural effects may be of much importance in explaining individual innovative behavior.

For example, in an analysis of the diffusion of innovations to teachers in Thai government secondary schools, Mortimore (1968) found very low correlations, most of which were not significant, between 51 independent variables and (1) teacher's awareness of new educational innovations, (2) favorable attitudes toward these new ideas, and (3) innovativeness. One reason for these low relationships very likely is the fact that structural effects were almost entirely ignored. The 51 variables, mostly drawn from U.S. educational diffusion studies, measured individual characteristics and attitudes, but paid no attention to school effects on teacher behavior. In other words, the analysis treated the teachers as if they did not work in schools, and as if the school did not have a considerable effect on each teacher's diffusion behavior. Yet it is one's fellow school teachers in Thailand with whom one interacts most about innovations. Their characteristics and beliefs thus have great effect on one's knowledge, attitude, and adoption of educational innovations.*

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*A research focus upon the role of liaison individuals was initiated by Jacobson and Seashore (1951), and followed by Weiss and Jacobson (1955).

Yet further evidence of the importance of structural (or compositional) effects in explaining individual innovativeness is provided by Quadir's (1966) analysis of data from some 600 villagers in 26 Philippine neighborhoods. He found that the compositional effects (of neighborhood mean education, mass media exposure, etc.) were about as effective as predictors of individual innovativeness, as were individual variables like education, media exposure, etc.

What are structural effects? They are effects of the social structure of the system on the behavior of a person who is a member of the system.** For example, one can conceptualize a teacher's innovative as explained by two types of effects: (1) the individual's personality, communication behavior, and attitudes; and (2) the makeup and norms of his school, that is, its social structure. The first class of variables are individual, the second are system variables. Both are used to predict a dependent variable at the individual level. The following mathematical expression illustrates these two types of variables in explaining innovativeness.*

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*A detailed report is forthcoming about the Thailand study, which is tentatively entitled: Institution-Building in Thailand: The Diffusion of Educational Innovations in Secondary Schools, Lansing, Michigan State University, Institute for International Studies in Education.

**For a more complete discussion of structural effects than we can provide in the present paper, see Blau (1957 and 1961), Davis and others (1961), Tannenbaum and Bachman (1964), and Campbell and Alexander (1965).

$$\hat{Y}_{ij} = a + b_i X_{ij} + c_i \overline{X}_{ij}$$

> Where $\hat{Y}_{ij}$ represents a teacher's (predicted) innovative behavior; X_{ij} represents a teacher's position on some predictor of his innovativeness, for example, his level of formal education; and $\overline{X}_{ij}$ represents his school's modal position on some predictor of innovativeness, for example, the average level of formal education of his fellow teachers.

The amount of variance in Y, teacher innovativeness, explained by $\overline{X}$'s, the system variables, is due to structural effects.

Why would we expect structural effects? There are at least two reasons.

First, any type of human behavior can be partitioned in terms of within and between variance. We generally find a much higher degree of homogeneity within social systems than between social systems.

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*This formula is necessarily oversimplified in that (1) it assumes linear relationships, and (2) it ignores the possibility of interaction effects between individual and system variables.

This may in part be due (i) to ecological reasons such as the similarity of climate, heredity, and so forth; (ii) to past interaction, because it is through such interpersonal communication that greater homogeneity (at least in attitudes and beliefs) results over time; and (iii) to selective attraction factors, which act to draw similar individuals to the same kinds of groupings.

Second, the group or the social system has a social structure (such as norms) which affect individual behavior in it, because the system is an important reference group influence on the individual's decisions, and because of the social control of the system over the individual's behavior.

The basic assumption of structural effects is that more variance in individual behavior can be explained by utilizing independent variables for both the individual and the social system of which he is a part, than by using only independent variables measured at the individual level alone. We ought to proceed to test this proposition with data about the diffusion of innovations to individuals within educational organization. Such investigation will lead to theoretical understandings about the role of social structure on individual behavior, as well as to practical insight about how to organize education in order to facilitate change. As yet, we lack research attention to social system variables as explainers of individual diffusion variables, and notably absent from our past analyses are one important type of system variables, those dealing with the structure of the system.

So far in this paper, we have explored two compatible methodological approaches to needed diffusion research in educational organizations: relational analysis and structural effects. Now let us shift our focus to the main types of concepts that we should explore in such studies.

POTENTIAL CONCEPTUAL EMPHASES

We will focus on four interrelated categories of variables in our paradigm of the diffusion of innovations in educational organizations: (1) diffusion effects variables, (2) communication variables, (3) social system variables, and (4) consequences variables (see Figure 1). Let us explain briefly what is meant by each category of variables, before discussing the details in each category.

DIFFUSION EFFECTS VARIABLES. These are the dependent variables in most studies, the variables which reflect the immediate effects of the diffusion of innovations. These include such dependent variables in diffusion research as knowledge and adoption of innovations, attitude toward innovations.

COMMUNICATION VARIABLES. This category includes dimensions indicating the nature and amount of communication in an on-going organization, such as the number of relevant communication messages, accuracy of upward communication, etc. Under this category, we will also discuss such aspects of communication as the message attributes, channels, etc.

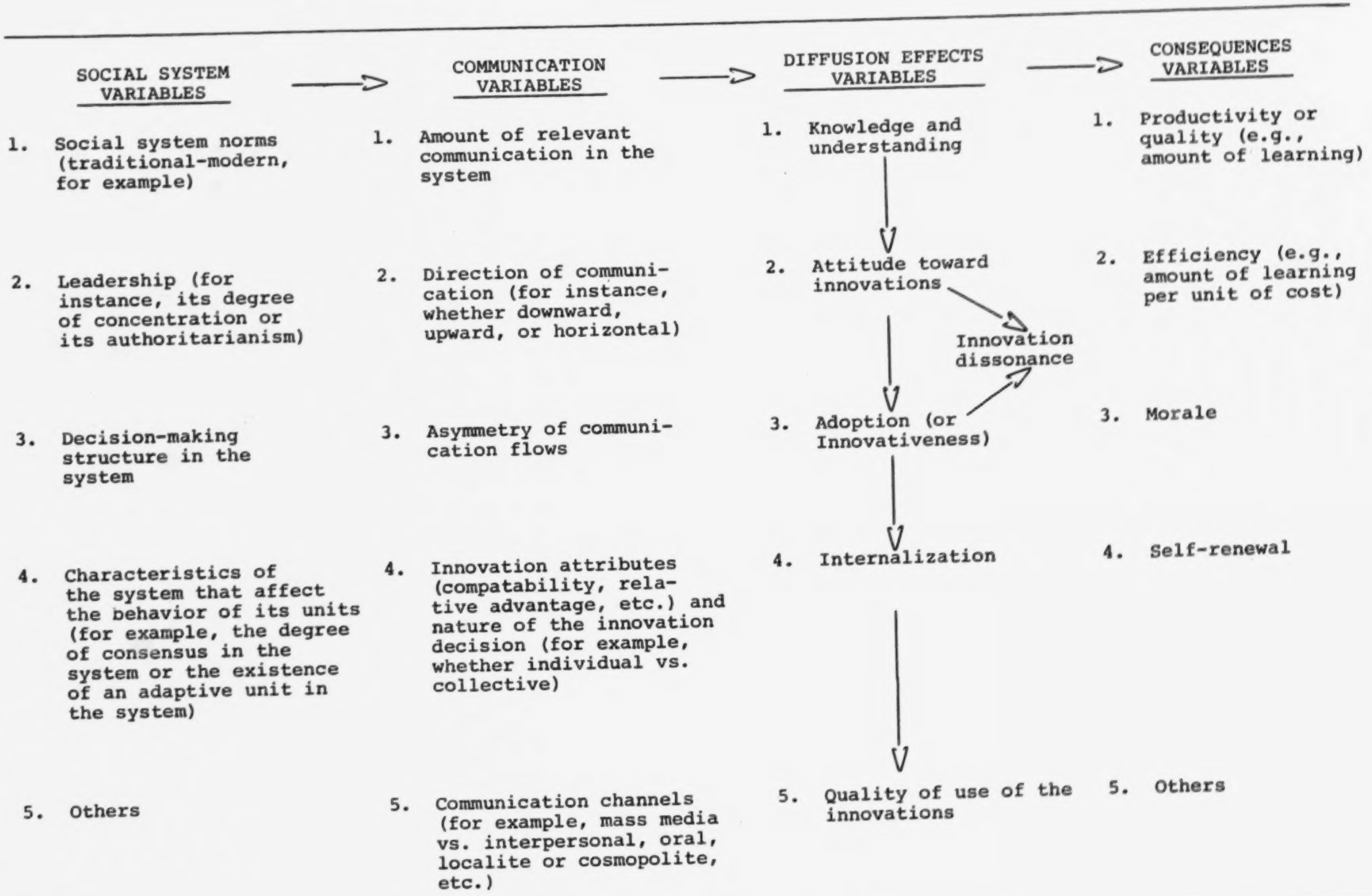
SOCIAL SYSTEM VARIABLES
COMMUNICATION VARIABLES
DIFFUSION EFFECTS VARIABLES
CONSEQUENCES VARIABLES
1. Social system norms (traditional-modern, for example)
2. Leadership (for instance, its degree of concentration or its authoritarianism)
3. Decision-making structure in the system
4. Characteristics of the system that affect the behavior of its units (for example, the degree of consensus in the system or the existence of an adaptive unit in the system)
5. Others
1. Amount of relevant communication in the system
2. Direction of communication (for instance, whether downward, upward, or horizontal)
3. Asymmetry of communication flows
4. Innovation attributes (compatability, relative advantage, etc.) and nature of the innovation decision (for example, whether individual vs. collective)
5. Communication channels (for example, mass media vs. interpersonal, oral, localite or cosmopolite, etc.)
1. Knowledge and understanding
2. Attitude toward innovations
Innovation dissonance
3. Adoption (or Innovativeness)
4. Internalization
5. Quality of use of the innovations
1. Productivity or quality (e.g., amount of learning)
2. Efficiency (e.g., amount of learning per unit of cost)
3. Morale
4. Self-renewal
5. Others

FIGURE 1. Paradigm of variables and conceptual relationships in the diffusion within educational organizations. (The diagram does not pretend to be a complete theoretical system; it is a summary paradigm designed to illustrate the main variables discussed in this paper.)

SOCIAL SYSTEM VARIABLES. This category refers mainly to the structural characteristics of an organization. These variables are relatively unchanged over a sufficiently long period of time, and are relatively difficult to change. An instance is leadership style, a variable which could be manipulated via training and selection, but this only in the relatively long range.

CONSEQUENCES VARIABLES. This category includes variables which reflect the consequences or effects of innovations in the organization, such as productivity, morale, etc.

Diffusion Effects Variables

Past innovation-diffusion research have been mostly concerned with such dependent variables as the time of awareness and the time of adoption of innovations (or innovativeness). In his study of three Michigan high schools, Lin (1966) measured two new dependent variables which he considered important in studying diffusion within organizations: (1) *innovation internalization*, defined as the extent to which a member of an organization perceives the innovation to be relevant and valuable to his role performance, and (2) *change orientation*, defined as an individual's degree of general predisposition toward change.

In the very few past studies dealing with educational diffusion within organizations,* teacher innovativeness seems to be the most commonly studied variable. Teacher innovativeness within a school would be near zero if all teachers complied immediately and directly with their administrator's innovation decision, if there were 'perfect' communication of the decision, etc. Perhaps a major dependent variable in studies of forced innovation decisions should be the teacher's attitude toward the innovation or innovations. Overt behavior of its members may be manipulated by the organization, at least in the short range, but perhaps the teachers' attitudes toward innovations affect continued adoption versus discontinuance of the ideas over a relatively longer time period.

Figure 2 shows yet another variable which might be studied in the case of forced decisions,** which often occur in organizational settings. Innovation dissonance is the discrepancy between the organization

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*Most past educational diffusion research has been concerned with school-to-school diffusion, where school innovativeness is the main dependent variable, rather than within-school diffusion. In fact, there are actually very few studies of within-organizational diffusion, whether in education, industry, or elsewhere. Examples of the few such studies available are: Becker and Stafford (1967), Carroll (1967), Knight (1967), Sapolsky (1967), Shepard (1967), Evan and Black (1967), Lin (1966), Wager (1962).

**A forced innovation decision is defined as one in which the individual has no legitimate influence, but is ordered to adopt or reject by others. In contrast, individual innovation decisions are those in which the individual has influence.

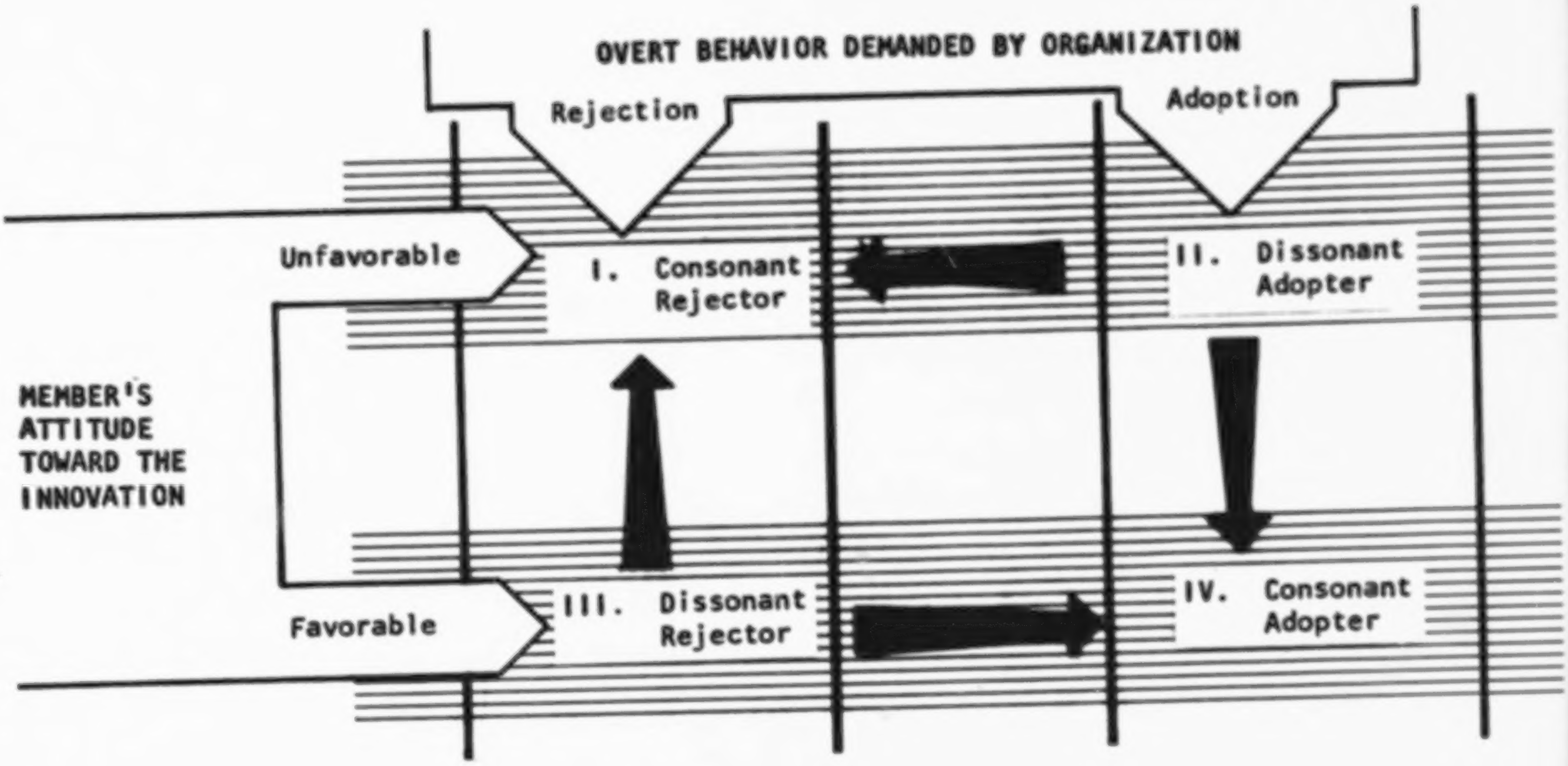
OVERT BEHAVIOR DEMANDED BY ORGANIZATION
Rejection
Adoption
Unfavorable
Favorable
MEMBER'S ATTITUDE TOWARD THE INNOVATION
I. Consonant Rejector
II. Dissonant Adopter
III. Dissonant Rejector
IV. Consonant Adopter

FIGURE 2. Four dissonant-consonant types on the basis of individual attitude toward an innovation and overt behavior demanded by the organization. (Adapted from Knowlton, 1965, p. 53.)

(Arrows indicate pressures toward consonance.)

member's (in our case, teacher's) attitudes toward the innovation and the overt behavior (adoption or rejection) of the innovation as demanded by the organization (i.e., the school system). Types I and IV in Figure 2 are consonant, in that their behavior is in line with their attitudes. Type II and III both have cognitive dissonance (Festinger, 1957), because the member's attitude toward the innovation is discrepant with his behavior within the organization. The balance notion of tension-reduction suggests that there will be a tendency over time for Type II's and Type III's to (1) change their attitudes to make them consonant with the behavior demanded by the organization, or (2) discontinuance of the innovation, misuse of the innovation, or circumvention of the innovation order, to make their behavior consonant with their attitudes. This strain toward balance will cause Type II's and Type III's to become either Type I's or Type IV's, whichever is easier for the individual to achieve.

In summary, when an individual member's cognitive system is dissonant with the overt behavior toward an innovation demanded by the organization, the individual will attempt to reduce the dissonance by either changing his attitudes or his behavior.

The extent of knowledge and understanding of the innovation is another useful dependent variable. Often we have looked at time of awareness, but not at the extent or degree of awareness and understanding of the innovation. In organizational settings, mere awareness about an innovation (like knowing that team teaching is a new method of pedagogy) does not tell us much of use. What matters more is whether an individual (or teacher) knows and understands details about the innovations.

Even if an individual has a favorable attitude toward the innovation, and has adopted, without understanding the implications of the innovation, there is a high chance of misuse of the innovation leading to undesirable consequences. So quality of use of the innovation is another important dependent variable. An innovation can be adopted in a variety of ways in terms of its quality of use, ranging from "use only for the sake of use" to very appropriate use. In educational organizations, where quality seems to be a main concern and the nature of teacher's job is both flexible and complicated, the quality of use of innovations seems to be an important variable, but one little-studied to date.

Communication Variables

Communication is the very essence of a social system or an organization. Katz and Kahn (1966) defined organizations from an "open system" viewpoint, characterizing an organization as both an energic and an informational system with the function of the informational system being management of the system. There is a general consensus that communication is essential to the functioning of an organization.

There is hardly any need at this point to discuss the importance of communication in the diffusion process. Diffusion is a communication process. It is that subset of communication, which deals with messages that are new ideas, or innovations. In organizational settings, the nature of the diffusion process for an innovation will be largely determined by the nature and amount of communication operating among the system's members. More specifically, the certain aspects of the communication process in any organization seem crucial for understanding and predicting the diffusion of innovations. Those aspects are (1) amount of relevant communication, (2) direction of communication, and (3) asymmetry of communication.

AMOUNT OF RELEVANT COMMUNICATION. In every organization, there are both formal and informal channels of communication. Often, the formal channels are characterized by the flow of messages relevant for achieving the organization's objectives, while the informal channels carry other (irrelevant) messages. In some other organizations, and even in some units within an organization, both formal and informal channels are used extensively for communication aimed at achieving organizational goals and improving the functioning of the organization. In these systems, there is high amount of relevant communication for the organization. We expect these kinds of organizations to provide a conducive climate for innovations to diffuse.

DIRECTION OF COMMUNICATION. Downward communication refers to the flow of information from superiors to subordinates, following the authority pattern of hierarchical positions. The classical theories of organization place primary emphasis upon this kind of communication. Organizations (also sub-units, and even organizational members) vary in the extent to which downward communication messages are accepted by subordinates. In some organizations, such communications are viewed with great suspicion, creating problems of misunderstanding and often rejection. In other organizations, downward communication is generally accepted, but if not, it is openly and candidly questioned, discussed, and clarified. We expect such organizations to facilitate the diffusion of innovations, which often flow downward through hierarchical channels of downward communication.

Upward communication is the flow of messages ascending the hierarchical ladder. Upward communication like downward, is essential for effective functioning of an organization. There is evidence that upward communication is often at least as inadequate as downward communication, and is probably less accurate because of the selective filtering of information which subordinates feed to their superiors (Likert, 1961). Katz and Kahn (1966) observe that in autocratic organizations, subordinates try to protect their position in the hierarchy by screening facts to accord with the perceived emotional biases of their superiors. This screening of upward communication takes place to some extent in all organizations, not only the more autocratic ones. In Read's (1962) study, the most important factor affecting the accuracy of messages from subordinates to superiors was the mobility aspirations of the lower status member. Another important factor was the interpersonal trust of the subordinate for his superior.

When upward communication in an organization is quite limited, and inaccurate, it becomes difficult to assess the 'true' reactions of organizational members (subordinates or teachers in case of schools) towards the innovations advocated by superiors. Initial resistance to the innovation may either not be communicated or may be distorted. Likert (1961) observes that the 'exploitive authoritative' organizations are characterized by inadequate and inaccurate upward communication, whereas 'participative' system of organization have a great deal of upward communication carrying relevant and accurate feedback information. The participative system provides a favorable climate for the diffusion of innovations, as superiors have adequate and accurate feedback information as to how teachers are reacting to innovations, and can clarify doubts and can overcome resistances.

Horizontal communication occurs between individuals at the same hierarchical level, for example, between two teachers. Some types of horizontal communication are critical for effective system functioning. Katz and Kahn (1966, p. 244) observe:

> Communication among peers, in addition to providing task coordination, also furnishes emotional and social support to the individual. . . . Hence, if there are no problems of task coordination left to a group of peers, the content of their communication can take forms which are irrelevant or destructive of organizational functioning.

In educational organizations, there seems to be a great deal of sideward communication. There are few formal controls over the horizontal flow of information. But how far is the sideward communication that goes on in the educational organizations concerned with matters of teaching and learning? Sieber (1967) states:

> The insecure professional self-image of teachers might also account for a notable tendency among teachers to avoid informal communication on matters of teaching and learning. My own observation of faculty rooms over a period of a year suggests that informal discussion of classroom practices is minimal.

Further evidence comes from a survey that requested teachers to nominate innovations they knew about that might contribute to the mental health condition of their pupils (Lippitt, 1965a). Out of a total of 330 ideas that were mentioned, only 30 came from knowledge of what other teachers were doing; the overwhelming majority were practices that the teachers themselves were following. Lippitt concluded, "People usually do not know what other people are doing within their school buildings."

We know very little about the role of horizontal communication in the diffusion of innovations in educational organizations. How far does the "two-step flow of communication" operate in organizational diffusion among peers? What role do liason individuals play in horizontal flows? Since sideward communication is characterized by high homophily, this provides a climate for free and frank discussion about the innovation (if the organizational members feel motivated to talk about matters relevant to the organization) and thus have a more thorough understanding about the innovation, and even peers can exert some influence for adoption.

ASYMMETRY OF COMMUNICATION. Asymetrical communication flows occur when the information requirements of superior and subordinate are not symmetrical or complementary. What the superior wants to know, is not what the subordinate wants to tell him; what the subordinate wants to know is not the message the superior wants to send. The greater the conflict between the communication needs of these two hierarchically-situated senders and recipients of messages, the more likely is an increase in lateral communication (Katz and Kahn, 1966, pp. 247). Communication asymmetry seems to be an important variable because it can explain some of the problems of misperceptions and misunderstandings in superior-subordinate communication exchanges which often lead to communication breakdowns. The concept of asymmetry bears a close relationship to our previously explained concept of heterophily.

For studying these communication variables, namely amount of relevant communication, direction of communication patterns and asymmetry of communication flows, various forms of relational analysis (discussed previously in this paper) seem especially appropriate.

So far, we have discussed variables relating to the nature of communication system operating in an organization irrespective of the type of messages (or innovations) and of communication channels used for diffusing the messages (e.g., mass media, or interpersonal channels). Other communication variables are the nature of innovation (e.g., individual versus collective,* technological versus restructuring) and the attributes of the innovation (for example, whether it is compatible with the system's norms, whether it is highly advantageous over the old practice it replaces, etc.). Although these are also important determinants of the nature and speed of diffusion within organizations, these variables are not discussed here in detail because of their detailed treatment elsewhere.

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*Collective innovation decisions are defined as decisions in which the individuals in a social system adopt or reject by consensus and all must conform to the system decision.

The communication variables which have been discussed in this section are often "intervening" in nature and are to some extent determined by other organizational variables (such as leadership style, decision-making structure, etc.). This leads us to the discussion of social system variables.

Social System Variables

Organizational scientists have been concerned with studying the relationship of organizational effectiveness to such variables as the system's norms, leadership, degree of centralization in decision-making, methods of supervision, etc. These variables have been almost entirely neglected in studies dealing with diffusion in organizations.

SOCIAL SYSTEM NORMS have an important bearing on the diffusion and adoption of new ideas. Norms are patterns for behavior. If a system's norms are progressive and encourage change, as in school systems like Cape Kennedy, Shaker Heights, Troy, and Newton, educational innovations are likely to diffuse rapidly. If the norms are traditional, however, teacher acceptance of new ideas is likely to be relatively much slower. There is evidence from numerous studies that a system's norms affect the rate of diffusion (Rogers with Shoemaker, 1968). Consider two identical, equally well-trained teachers who have just graduated from college. One is employed in Newton, Massachusetts, and the other in Cassopolis, Michigan. At the end of one year, we would expect a major difference in the adoption of innovations by the two teachers.

LEADERSHIP makes an important contribution to organizational effectiveness (Likert, 1961). The style of leadership recommended by Likert is best illustrated as the "principle of supportive relationships." As he put it:

> The leadership and other processes of the organization must be such as to ensure a maximum probability that in all relationships with the organization each member will, in the light of his background, values, and expectations, view the experience as supportive and one which builds and maintains his sense of personal worth and importance (Likert, 1961, p. 103).

This supportive leadership climate creates the conditions that lead to a full and efficient flow of relevant messages in all directions throughout the organization. This full and open flow of useful information provides accurate data to guide action, to call attention to problems as they arise, and to assure that sound decisions based on all available facts are made (Likert, 1961, pp. 238-239). This kind of communication system will tend to facilitate the free flow of innovations in the organization, and will encourage organizational members to discuss the innovation with their superiors, which will hopefully lead to adoption of innovations by the organizational members.

DECISION-MAKING STRUCTURE. Some organizations are characterized by centralized decision-making structure in which most of the decisions are made at the top of the organization. This does not contribute to motivate implementation of the decision by the system's members. Non-participation often creates resistance, especially in educational organizations, where teachers often perceive themselves to be capable of making innovation decisions. On the other hand, if the organization's members (teachers) are involved in innovation decisions affecting them, there will be more motivation to implement the decisions. Also, the quality of the decisions will tend to be better, as the decisions are made in light of more technical and professional knowledge and better understanding of the problem under concern. This participative decision-making seems to provide a better climate for the adoption of innovations among teachers. Also, the participation of organizational members in decision-making facilitates a more thorough discussion and evaluation of the innovation, and only sound and relevant innovations will be adopted. So the problem of too-hasty adoption* will be partly eliminated.

Evidence supporting the proposition that participation of the system's members in innovation decisions leads to a more rapid rate of adoption is provided by an analysis in six urban school districts. Gittell and Hollander (1968, p. 197) found that "because participants in the policy process are so limited, alternatives are also limited, and school policy choices are narrowly conceived. Innovation is rare, and creativity, competition, and experimentation are discouraged."

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*"Several authorities have even claimed that a new problem has emerged in many schools--the problem of too hasty adoption" (Sieber, 1967, p. 2).

CHARACTERISTICS OF THE SYSTEM affects behavior of its members. Recognizing the continuous need for organizational change to insure organizational survival in a changing environment, many formal organizations develop an internal unit concerned with sensing the need for change and enabling self-renewal. These units are called research and development, market research, educational development unit, etc. Gardner (1963, p. 76) described the purpose of such an adaptive unit: "Perhaps what every corporation (and every other organization) needs is a department of continuous renewal that would view the whole organization as a system in need of continuing innovation." In a large school system such a self-renewal or adaptive unit could select appropriate innovations to meet the school's changing needs, encourage innovation trials and demonstrations, and seek to promote the wide-spread adoption of new ideas throughout the school.

The presence of such an adaptive or self-renewal unit should speed up the diffusion process. Obviously there are also many other system variables that affect the diffusion of innovations; an example is the degree of consensus or agreement in the system, which we expect to encourage innovation. Likewise, there are many other structural effects on diffusion in organizations; few have yet received adequate research attention.

Consequences Variables

It has been said that this is a time of great innovation but very little change in education. The point is that many new ideas are being promoted and adopted in our educational institutions, but the end result is little alteration in the corpus of education. We simply do not know much about the consequences of the diffusion of innovations. Many educational innovations have been of a fadlike nature, and after their widespread adoption, it has been difficult to measure increased educational achievement. Other innovations in education with a similarly low degree of relative advantage have been adopted, but then discontinued after a short time.

This problem suggests the need for including the study of consequences of innovation-adoption in our paradigm of needed research on diffusion in educational organizations. Past researchers have asked the question: "What are the correlates (i.e., antecedents) of educational innovativeness? "The numerous studies of Paul Mort and his students at Columbia University* were of this type. They found that more innovative schools were characterized by greater wealth, more cosmopolite school staffs, etc. These findings are highly useful if one wishes to understand innovativeness of school systems. But the study of such dependent variables (like innovativeness) is not enough. Our research should try to explain the consequences of innovation in education, especially educational quality and efficiency, rather than innovativeness or other diffusion effects *per se*. Figure 3 shows our enlarged model for educational diffusion research, in contrast to the paradigm utilized in most past research (Rogers, 1965).

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*These studies are summarized in Ross (1958). Actually, these researchers assumed that more innovative schools (they termed them more "adaptable") had higher quality instruction, but they presented no evidence of this relationship.

What specific advantages would accrue from using this expanded model in conducting future research on educational diffusion? A crucial question to be answered in such a study would certainly be: "What improvements in educational productivity or quality result from the adoption of each innovation?" If the answer were known, we predict that the rate of adoption of educational innovations with high relative advantage would increase; correspondingly, those new ideas without sufficient relative advantage would be dropped from our promotional efforts, as they should be.

There are, of course, other consequences of educational innovation than changes in educational quality and productivity, and these need investigation too. Organizational researchers have been concerned with such dependent variables as member-satisfaction or morale, efficiency, etc. These variables, when translated in terms of educational organizations, may provide meaningful indicators of innovation consequences. By studying such effects, it is possible to integrate research results from educational diffusion studies with the research literature on organizations, as both will be concerned with similar dependent variables.

With our paradigm (Figure 1), the diffusion effect variables (discussed earlier) are a sort of

FIGURE 3

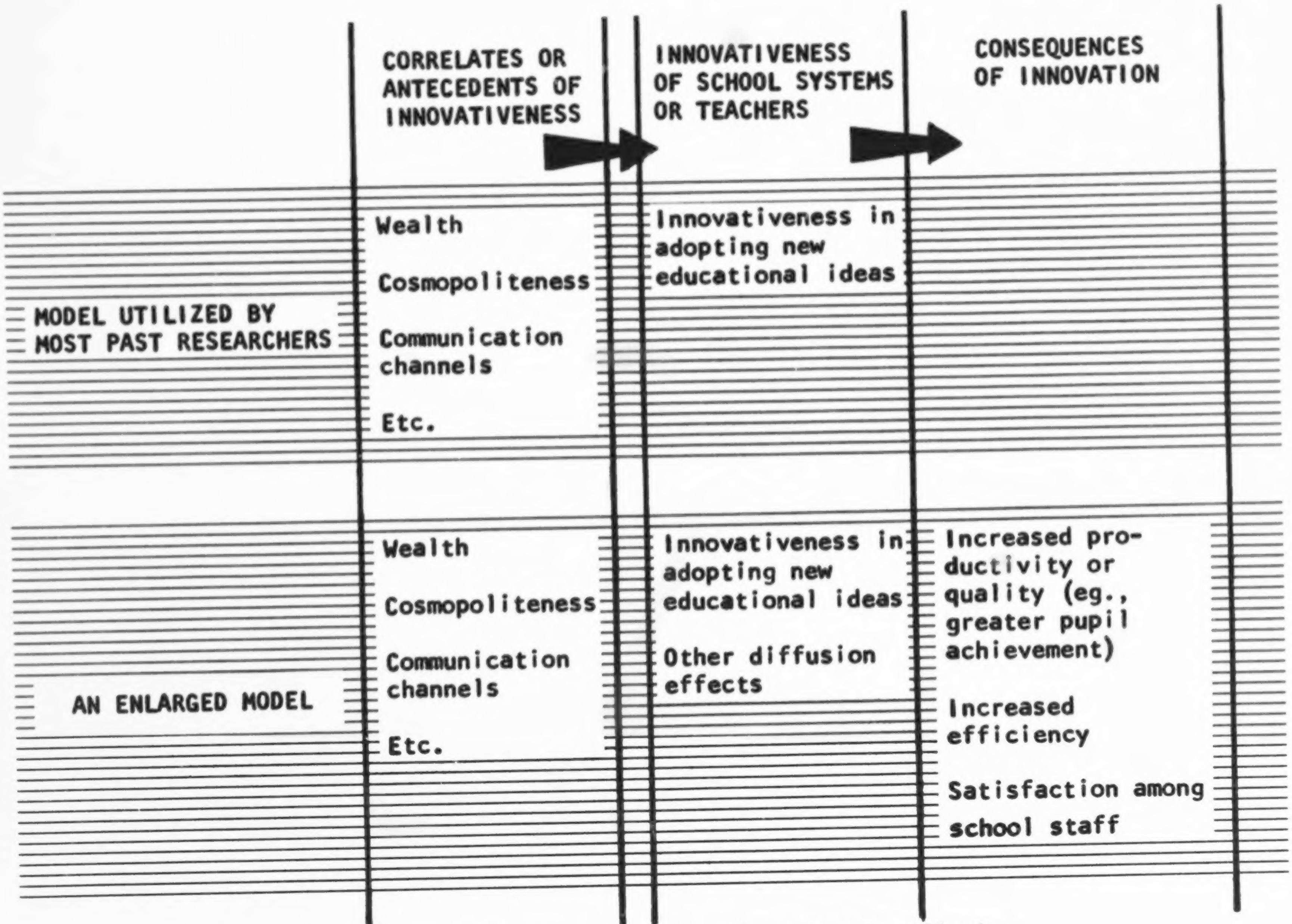
CORRELATES OR ANTECEDENTS OF INNOVATIVENESS
INNOVATIVENESS OF SCHOOL SYSTEMS OR TEACHERS
CONSEQUENCES OF INNOVATION
MODEL UTILIZED BY MOST PAST RESEARCHERS
Wealth
Cosmopoliteness
Communication channels
Etc.
Innovativeness in adopting new educational ideas
AN ENLARGED MODEL
Wealth
Cosmopoliteness
Communication channels
Etc.
Innovativeness in adopting new educational ideas
Other diffusion effects
Increased productivity or quality (eg., greater pupil achievement)
Increased efficiency
Satisfaction among school staff

FIGURE 3. A comparison of an enlarged model for educational diffusion research with the model utilized by most past researchers.

"intermediate dependent variables" and the consequences variables are more "ultimate" dependent variables. Use of the new research model as a general guide for research on educational diffusion will undoubtedly yield evidence of undesirable as well as unanticipated consequences of innovation.

Other research traditions on the diffusion of innovations have been as amiss as education in failing to view the correlates of innovativeness as only preliminary steps toward the explanation of more ultimate innovation consequences. For instance, rural sociologists studied the correlates of agricultural innovativeness, but not the results of this innovativeness in explaining higher farm production, greater farm profitability, etc. Likewise, concern with the adoption of family planning methods has only partly included the consequences of this adoption in terms of lower fertility rates. Only the anthropological diffusion tradition has placed proper emphasis upon the consequences of innovation. So our point is that researchers on educational diffusion need to learn from the anthropologists, and like them, stress the consequences more and the antecedents less in the study of innovation.

SUMMARY AND CONCLUSIONS

Our point of departure in this paper is that in spite of the volume of research attention devoted to the diffusion of innovations, relatively little emphasis has been placed upon diffusion within organizational structures. Our paper calls for directions in which such needed inquiry might profitably take.

Methodologically, we call for relational analysis, in which the unit of analysis is a dyadic pair, a sociometric chain, or cliques or sub-systems as indicated by a matrix of communication relationships. We feel that past diffusion research has overemphasized investigation in which the individual, rather than the communication relationship, is the unit of analysis. Relational analysis is especially advantageous in determining the nature of heterophily-homophily in diffusion. Homophily is the degree to which two individuals who interact are similar.

We also call, procedurally, for the study of structural effects as system variables in the diffusion of innovations within educational organizations. Structural effects are the consequences of the system's social structure in which one is a member, on his behavior. For instance, teacher innovativeness is partly a function of such independent variables as the teacher's cosmopoliteness, educational level, etc., but teacher innovativeness is also in part a function of such system variables as structural effects.

Conceptually, we call for the study of four interrelated categories of variables namely, diffusion effects variables, communication variables, social system variables, and consequences variables. The social system variables affect communication variables, which in turn affect the diffusion effect variables, and these diffusion effects lead to consequences variables. We need to focus our attention on such diffusion effects (dependent) variables as attitude toward innovations, innovation-dissonance, extent of knowledge and understanding about innovations, and quality of use of the innovation.

We need to examine the effect of such communication variables as the amount of relevant communication, direction of communication patterns (downward, upward, or horizontal), and the asymmetry of communication flows. Also, we need to study the effects of innovation-attributes and communication channels in diffusing innovations within organizational settings.

The communication variables affecting diffusion are often determined by other social system variables. Hence we need to focus on such social system variables as system norms, leadership style, decision-making structure, etc.

We have often ignored the study of consequences variables which reflect the effects of innovation. We need to analyze such consequences variables as the productivity and quality, efficiency, morale, self-renewal, etc. Thus, we need to enlarge our model of diffusion research in several directions: to include a class of more ultimate dependent variables dealing with innovation consequences, and also toward including social structural variables.

We should also utilize such methodological advances as relational analysis and the study of structural effects in diffusion investigations. Then indeed we will have new wine in new bottles. And the result will provide us with insight into the nature of human behavioral change in organizational settings, as well as implications for more rapid educational diffusion.

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INNOVATIVE METHODS
FOR STUDYING INNOVATION IN EDUCATION

by

Nan Lin

AN OVERVIEW OF RESEARCH METHODS

The purposes of this paper are (1) to examine the research methods generally utilized in diffusion research, and (2) to suggest certain research methods which may help provide us with better understanding of the diffusion process.

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Research method is very liberally defined here. It includes all phases of research when a strategic decision has to be made in regard to the design, sampling, operationalization of variables, data collection, data processing and analysis. In a broad sense, a research method is the complete operationalization process of a conceptual or theoretical scheme and will be considered as such in this paper.

In order to examine the research methods generally utilized in studying innovation diffusion, it may be fruitful to describe a simplified, somewhat typical example of such a study.

Let us imagine that Researcher "A" wants to study the diffusion of an educational innovation or a number of innovations in a school system. First of all he designs a conceptual scheme in which the central focus is the extent of innovativeness in the system. Operationally, innovativeness is measured in terms of the time required for the innovation to be adopted, the degree of adoption, or the number of innovations adopted.

The researcher then defines the population he wants to survey, which usually consists of a number of students, teachers or superintendents. Then he determines how to draw a sample from this population. A questionnaire is designed which includes the adoption index as well as a number of social and psychological variable items. These social and psychological variables are to be taken as the independent variables or factors which may explain the degree of innovativeness of the system. Then, a research team goes to the research locale and interviews all the people included in the sample. The team asks the respondents to give opinions or factual information (through recall). The completed questionnaires are then coded, keypunched on IBM cards, sometimes standardized, and fed into computers. Correlational or multiple-regressional analysis routines are used to determine the extent to which (in variance terminology) each of the independent variables explains the dependent variable (which is the innovativeness of the system). Hopefully some simple inter-correlations will reach the significant level of .05 or the variance explained will exceed 40 or 50 percent.

From this simplified, hypothetical diffusion study, we have isolated some characteristics of the research methods generally employed and I would like now to point out some of these characteristics more specifically and to comment on them.

1. OUR RESEARCH FOCUS has been very narrow (especially the selection of dependent variables). Inevitably, it is the innovativeness of either an individual or a system. Operationally, the focus is likely to be the extent of adoptions of a number of innovations or the earliness of adoption dates. Furthermore . . .

2. . . . WE USUALLY RELY ON THE RESPONDENT'S recall ability in obtaining such data. Reliability of such data, especially when data involve recalled dates of first adoptions, becomes rather questionable.

3. OUR UNIT OF ANALYSIS is usually the person who adopts or rejects the innovation. In other words, our research attention has been pretty much receiver-oriented.

4. OUR RESEARCH IS USUALLY A ONE-SHOT JOB. We conduct one survey in a given time period, which means we see a slice of reality at a frozen point of the time dimension.

5. OUR ANALYTIC SCHEMES consist mainly of correlational analyses. The tendency is such that we try to include as many independent variables as possible and let the computer or graduate students tell us which correlations and how many such correlations are significant. For the more daring scholars, ingenuity is well used to conceptualize a paradigm or theory which hopefully will account for the relationships found between the independent and dependent variables.

I have given a sterile and rather critical discussion about the research methods utilized, methods upon which we are trying to build our understanding of the diffusion of educational ideas. To critically evaluate the shortcomings of the research methods, we must now take a step backward and ask ourselves two basic questions.

1. What do we really want to know about the diffusion of educational ideas and practices?

2. Are the research strategies currently being employed capable of giving us such information?

The first question is a conceptual one. It seems to me that investigation of the diffusion of educational innovations should be made a concrete vehicle for understanding educational change. An understanding of educational change, in turn, should lead us into building a sounder educational institution, which constitutes one of the backbones of the social system.

If this argument is valid, then we must know not only how and why schools or teachers adopt innovations. We must understand as well the process by which the innovations are diffused or disseminated to the schools and teachers. This further implies that we must take a process view of the problem at issue. Given this conceptualization, we must have a wider scope of research foci and we must see innovativeness within a school system or among teachers not as the end-goal in our research strategy, but as a component in the dynamic process of educational change.

What, then, should we, as researchers, take into consideration once we have determined that an understanding of the complete diffusion process of educational innovations is essential? In other words, to what other components, in this conceptual schema, should we also pay our research attention? I would like to suggest the following considerations.

WE MUST PAY MORE ATTENTION to the decision-making process. Decision-making takes place when the initiators of innovations consider alternative new practices and ideas, when the intermediate disseminators (or "gatekeepers") make their choices among innovations legitimized by the initiators and transmit the selected parts, features, or information about the innovations to filter down to the receiving or adopting units, and when the adopting units assess the values and assets of the innovations filtered down to them and decide to what extent they want to adopt or internalize the new ideas and practices.

So, decision-making is a very complex process which involves different strata of decision-makers as well as different internal stages. Some of these distinctions are discussed elsewhere and I will not go into detail here (Lin and others, 1966).

WE MUST FURTHER INVESTIGATE the process of gatekeeping. As I just mentioned, an innovation is usually diffused through a number of levels in the educational system. The intermediate units in many cases have extensive power in determining to what extent the information about the innovation and the innovation itself will be diffused or disseminated to the adopting units. An understanding of the belief systems and information processing patterns of these gatekeepers is certainly a necessary ingredient in our understanding of educational change (Katz and Lazarsfeld, 1955).

WE MUST FIND OUT HOW AN INNOVATION is implemented after it has been adopted. The process of innovation diffusion does not terminate when the innovation is adopted. How is it actually implemented? To what extent have the adopters internalized (or become attitudinally committed to) the innovation? Are all available manpower and equipment being effectively utilized? How should presently unavailable but necessary manpower and equipment be made available? All these problems of innovation implementation need research attention.

FINALLY, WE MUST STUDY THE EFFECTS of innovation upon the education system and its relevant societal environment. A change in one part of the structure is likely to cause changes in other parts. And the school system is but a subsystem in the social system.

How can we determine the extent of success or failure of an innovation in an educational system? How does the school system assess the effects of an innovation? Again, these questions call for immediate research attention.

In suggesting a process view of the diffusion of education innovation, I have raised a number of relevant questions. Are the research strategies currently employed capable of giving us answers to these questions? The reply is a painful "no." In order to have a clear view of educational change we must widen our research to cover more than just the innovativeness of the adopting units, we must get more reliable data, other than from recall, we must somehow grasp the dimension of time and we must utilize more powerful and precise analytic tools to assess our data.

In the last two decades many new research methods have been developed which may help answer our conceptual questions. In the following section, I would like to discuss three such methods which promise to help solve some of the problems faced by students of educational change. Promising though these methods are, I might add, they have seldom been "diffused" or "implemented" in diffusion research in education.

FIELD EXPERIMENT, COMPUTER SIMULATION AND STRUCTURAL ANALYSIS

The first research method I want to discuss here is field experiment. Survey research has been criticized for its lack of control over extraneous variables. Therefore, the findings from survey research lacks the precision to determine the causal relationship between the dependent and independent variables, even in the weaker sense of such relationship (namely, the sequence of occurrences of the variables in a bounded segment of time). On the other hand, laboratory experiment has been criticized for its narrow definition of population and for its use of a vacuum environment which does not exist in reality. Field experiment is designated as a solution to the debate between generality of findings and precision of measurement. With a representative sampling of a social system and careful manipulation of and control over one or more independent variables, field experiment may achieve both generality and precision.

How can field experiment be used for studying educational innovations? Let me give an example of such usage. At Hopkins, a number of my colleagues are developing simulation games, such as consumer's game, legislature game, parent and child game, and career game (Boocock and Coleman, 1966, pp. 215-236; Boocock, 1967). These games are intended to give students an opportunity to experience in a game situation various roles they will have to play when they enter society. Hopefully, these games will help the students to be prepared to face and to adjust to the complex world they will encounter when they leave school. Some of these games have been tried in schools all over the country. Now, it is being considered that the games be systematically disseminated to various school systems. How should such innovations be introduced? This seems to me to be an interesting question. Should they be introduced directly to individual teachers? Or should they be disseminated to the principal or the superintendent? Is it valid to argue that teachers' participation in deciding whether the simulation games be adopted by the school system can affect the eventual success or failure of the innovations? Furthermore, under what circumstances should the games be played by students on a voluntary basis and under what circumstances and with what anticipated effects should they be mandatory?

The selection of the best strategy for disseminating the simulation games calls for a series of field experiments. The research design of such experiments may follow the following procedure:

1. Select a number of school systems with similar geographical features, similar numbers of students and teachers, and similar degree of innovativeness (in terms of number and kind of innovations adopted in the schools).

2. Introduce the simulation games through the superintendent and the principal in some schools, through the principal in some other schools, and directly to the teachers or students in still some other schools.

3. After a period of time, measure the extent of innovation acceptance and duration of innovation acceptance in the various school systems.

The same procedure can be followed to test the differential effects of teachers' participation in the innovation decision-making process, parents' participations in the innovation decision-making process, and students' voluntary participation on the acceptance and continuing use of simulation games in schools. Of course, the actual design of the field experiments requires more rigorous procedure than the one I mentioned. My purpose here, however, is to demonstrate utilization of a research method in determining which will be most effective in disseminating an educational innovation.

In summary, field experiment is a combination of sampling procedure used in survey research, of variable control and of variable manipulation utilized in experiments. With a careful design and representative sampling, this method can not only isolate some low-level causal relationship between a number of variables, but can also help in policy-planning.

Computer Simulation

The next research method I would like to discuss is computer simulation. Curiously, although computer simulation is seldom utilized in studying educational change, a large member of education researchers are familiar with the terminology. This is perhaps due to the novelty of the term, simulation; and to the overwhelming impression made by the computer.

Simulation, in its dictionary definition, is pretending or feigning. It is, therefore, an imitation of a system or a process in reality. However, simulation has a slightly different meaning in academic circles. It is defined not as the imitation itself, but, rather, as an attempt to imitate. In this sense, simulation can be defined as a logical, technical or mathematical attempt to imitate a system or a process in reality through operationalization of a model. The model consists of a set of components and rules. The components correspond to a collection of variables of either social or theoretical significance. The rules specify the relationships and conditions for change among the components.

Three kinds of simulation can be distinguished:

A SIMULATION MAY BE CONSTRUCTED so that we are only interested in the outcome of a set of events or activities. This "black box" approach of simulation is called "one shot" simulation.

WHEN WE ARE INTERESTED IN SIMULATING the activities or events of a system at various stages over certain periods of time, then we need a "process" simulation. A process simulation attempts to imitate changes in a social system with a set of realistic components and rules.

WHEN WE ARE INTERESTED IN BOTH the behavior and outcome of a social system over time, then we use a "complete" simulation. A complete simulation is simply an attempt to imitate both the change and outcome of a set of events in a social system over time. It is, therefore, also the most difficult among the three kinds of simulation.

Simulation is inevitably linked with computers: simply because when we attempt to simulate a complex social system, there are too many components and rules to be handled manually or on paper.

How can computer simulation help our study of innovation diffusion in education? If we take the "process" view of the diffusion problem, computer simulation seems to be the logical tool to use. It has the following advantages:

It gives us a structural view of the educational system. We can build in such components as state educational boards, the superintendents, the principals, the teachers, the students, the parents, or whatever combination of these components is called for in a given educational system. The rules used can involve any specific relationship among the board, the superintendent, the principal, the teachers and the students.

Simulation may imitate the dynamic nature of reality. When we set the simulation model to function over time; in effect, we are attempting to imitate the change of the social system over time. This gives us an understanding of how an educational system actually works.

Since a simulation model can be manipulated easily, we may conduct experiments such as rearrangements of components and rules. We are thus free from the tremendous cost which would be involved were we to conduct such experiments in reality. The social system is also protected from whatever damage and ill effects which might arise from the rearrangements.

In summary, although computer simulation may still be a few years away from significant contribution to the study of educational change, it is important that we start exploring this new research method so we may be assured that significant contribution is forthcoming.

Structural Analysis

The third research method I would like to discuss here is structural analysis. In my opinion, one of the most important tasks in future diffusion research will be the exploring and locking into place of the relationships between the various properties of group structure* and diffusion of innovation indices** in the educational system. Therefore, instead of describing structural analysis in general terms, I would like in the remainder of this paper to discuss an exploratory study of group structure and innovation diffusion among teachers in three Michigan high schools.

GROUP STRUCTURE AND INNOVATION DIFFUSION WITHIN SCHOOLS

This study is intended to demonstrate how group structural properties can be analyzed in a way that is meaningful and that sheds light on the diffusion process of an educational innovation. The overall investigation was conducted in three Michigan high schools. These were selected on the basis of their similar geography, their comparable sizes, and on their similar degree of innovativeness, as observed in an early short questionnaire survey which covered some 70 high schools in Michigan (Rogers, 1962). The innovation investigated was flexible scheduling, selected on the following criteria: (1) the innovation was structural and therefore, once it was adopted, it necessarily involved every teacher in the school; (2) the innovation was adopted by the three schools within two years prior to the time of the research project and therefore the recall data from the teachers was still considered reliable.

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*See, for example, Bavelas (1960, pp. 725-730); Cartwright and Zander (1960, pp. 669-682); Berge (1962); Flament (1963); Harary and Cartwright (1965); Ross and Harary (1952, pp. 195-208).

**See, for example, Carlson (1965); Coleman and others (1966); Lin (1966); Lippett and others (1967, pp. 307-324); Rogers (1962); Yadov (1967).

In the self-administered questionnaire, a sociometric item asked that each teacher nominate three fellow teachers within the school whose opinions he most frequently sought with regard to problems related to his teaching performance. Each teacher was also asked to recall the date (month) prior to the school's adoption of the innovation when he first became aware of the innovation.

A four-item scale called innovation internalization scale also appeared on the questionnaire. This scale was intended to measure the extent to which the teacher perceived the innovation to be relevant and valuable to his role performance (Lin, 1966).

The questionnaire was completed by 45 of 57 teachers in School One, by 37 of the 53 teachers in School Two, and by all 37 teachers in School Three. After matching the demographic and professional data in the questionnaires (age, salary level, sex, courses taught, and attained educational level) against each school's roster of teachers, we were able to identify 42 teachers (74%) in School One, 37 teachers (70%) in School Two, and 30 teachers (81%) in School Three, which constituted our final sample for this particular study. No significant differences on sex, attained educational level or salary distribution were found among the teachers at the three schools. Teachers in School One tended to be older than those in the other two schools ($X^2 = 14.6$, with Yate's correction, d.f. = 6, $p = .05$).

Innovation Awareness and Internalization

The findings on the dates of initial awareness of innovation and of internalization are presented in Table 1. The median dates of first awareness of the innovation relative to the adoption date for teachers in Schools One, Two, and Three were three months, three months and four months respectively. School Three teachers seemed to have become aware of the innovation slightly but not significantly earlier than those in the other two schools. However, the variability of the awareness dates was significant among the three schools. The earliest knower in School Two reported the date as having been 85 months prior to the school's adoption of the innovation while the earliest knower in School Three indicated the date as 37 months prior to the adoption. The wide variability of initial awareness among School Two teachers was indexed by the degree of skewness (lack of symmetry) and kurtosis (relative peakness) of the distribution, also shown in Table 1.

To test whether the differences in the variability of awareness dates in the three schools were indeed due to differences in communication patterns, the awareness data were combined with the sociometric data in the following manner. An incidence matrix constituting all teachers in the sample in each school was constructed, with each row designating a

TABLE 1. Innovation awareness and internalization of teachers in three Michigan high schools.

	Innovation Awareness			Innovation Internalization		
School	Median Date*	Skewness	Kurtosis	Mean**	Skewness	Kurtosis
School 1 (N = 42)	3 months	0.68	2.50	7.56	1.02	2.74
School 2 (N = 37)	3 months	4.99	27.81	9.08	0.47	2.36
School 3 (N = 30)	4 months	2.83	12.95	6.78	1.36	4.75

*Number of months prior to the school's adoption of the innovation. The periods ranged 06-01 months in School 1, 85-01 months in School 2, and 37-01 in School 3. One teacher in School 2 claimed he had not heard about the innovation up to the time of the adoption of the innovation in the school.

**A t-test between Schools 2 and 3 mean scores for all respondents was significant at .01 level (t = 3.16, d.f. = 72, Var (School 2) = 13.18, Var (School 3) = 6.71).

nominating (advice seeking) teacher and each column a nominated (advice-sought) teacher. If Teacher "A" nominated Teacher "B," then the cell "AB" (A row and B column) recorded a value of one; otherwise it had a value of zero. The teachers were so ordered in the matrix that the earliest knower occupied the first row and column in the matrix while the latest knower occupied the last row and column. The matrix was further partitioned into groups of teachers who became aware of the innovation during the same month. The resulting three matrices are presented in Appendix "A." In each matrix, three types of communication patterns can be observed.

The upward communication was defined as a teacher's nomination of another teacher who had become aware of the innovation earlier than himself. Thus, all the cells in the left lower portion of the matrix, excluding the diagonal cells, were of upward communication. Similarly, downward communication was defined as one teacher's nomination of another teacher who had become aware of the innovation later than he had himself. Therefore downward communication includes the cells on the right upper portion of the matrix. Horizontal communication consisted of the diagonal cells. Percentages of the actual nominations in these patterns are shown in Table 2.

The data uncovered an important fact: there was more vertical communication (upward and downward communication) among School Three teachers than there was in School One, which, in turn, had more vertical communication among its teachers than existed in School Two. In fact, we can see that the proportion of horizontal communication among teachers in

TABLE 2. Frequency and direction of (teaching advice) communication patterns relative to innovation awareness.

School	Direction of Communication		
	Upward Communication	Horizontal Communication	Downward Communication
School 1 (N = 61)	52.5%	16.4%	31.2%
School 2 (N = 41)	34.1	39.0	26.8
School 3 (N = 68)	54.4	8.8	36.8

School Two was more than twice that of School One and more than four times that of School Three. It seemed that the variability of awareness dates reported by School Two teachers was indeed related to the communication pattern, namely to the relative lack of communication between early knowers and late knowers.

The four-item internalization scale consisted of two positive and two negative statements, with each item having seven response categories: (1) "agree very much," (2) "agree on the whole," (3) "agree a little," (4) "don't know," (5) "disagree a little," (6) "disagree on the whole," and (7) "disagree very much."

After all data were transformed into the positive direction, the scale allowed a maximum score of 4 (agreed very much on all four items) to a minimum score of 28 (disagreed very much on all four items). As shown in Table 1, the mean scores for Schools One, Two, and Three were 7.56, 9.08 and 6.78 respectively. Teachers in School Three not only showed the most frequent communication between early and later knowers, but also showed the most favorable attitude toward the innovation, relative to those in the two other schools. A t-test indicated that the difference between the mean scores obtained between Schools Two and Three was significant (no indication of strong skewness or kurtosis was observed in the distribution of internalization scores for the three schools).

DIFFERENTIAL GROUP STRUCTURAL PROPERTIES

Isolates, Cliques, Opinion Leaders and Liaisons

I have shown that (1) variability of teachers' awareness dates was related to the communication pattern, and (2) there was a significant difference in the extent of innovation internalization among teachers, with the teachers of Schools Two and Three differing the most and with School One data falling somewhere in between. It seemed, then, that the extent of teachers' innovativeness, as measured with the first awareness dates and internalization scale scores, indexed School Three as "high," School One as "moderate," and School Two as "low." Now, let us turn to the advice-seeking network among teachers in order to determine whether any structural clues can be found consistent with the different degrees of innovation receptivity in the three schools.

Presented in Figure 1 are the sociograms of teaching-advice seeking patterns among the teachers for the three schools. A visual check of these sociograms would indicate that the networks in the three schools were of three different types. School Three structure was tightly connected in a wired-wheel pattern in which each teacher was connected with other teachers in at least one path. We will ignore the direction of the path for the moment.

School One, with a number of "isolates" (teachers 35, 49 and 21) and with three small cliques (teachers 18-55-56, 42-05-52, and 25-12), presented a satellite structure, consisting of a large group and two satellite groups in its main clique. School Two

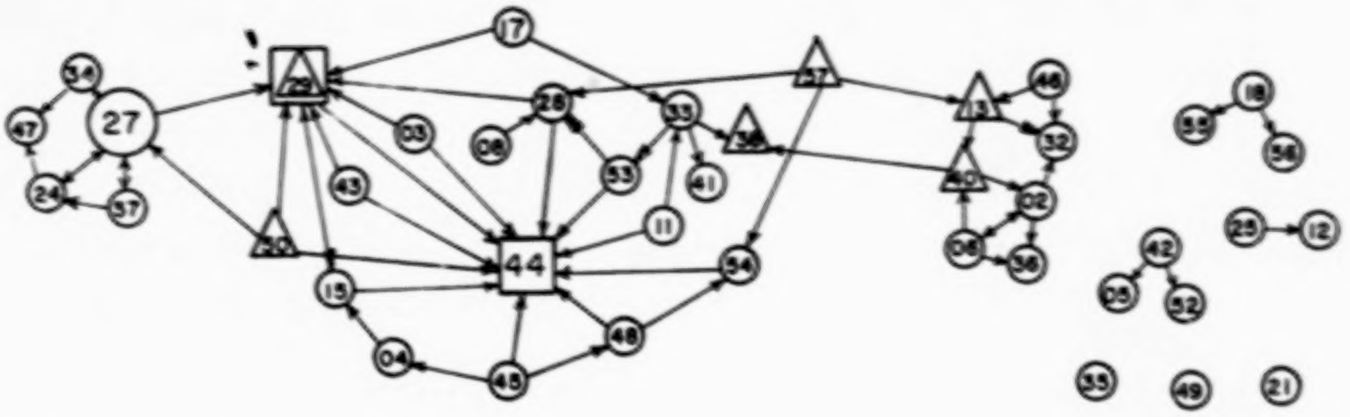
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FIGURE 1-A: SCHOOL 1 (N=42)

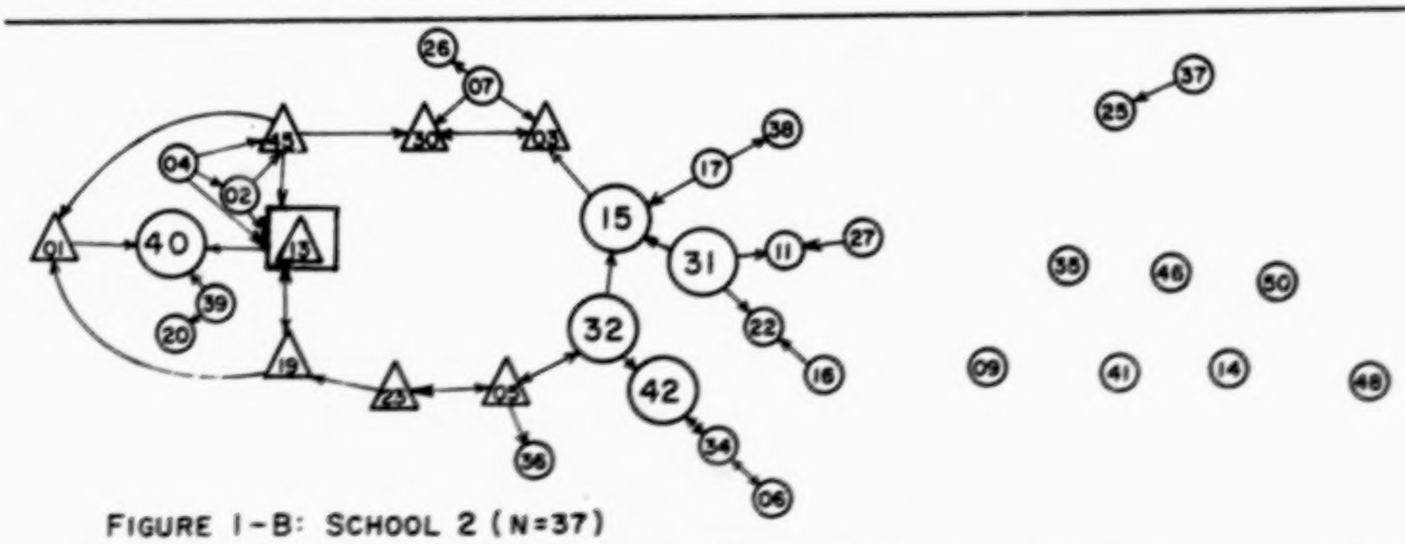
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FIGURE 1-B: SCHOOL 2 (N=37)

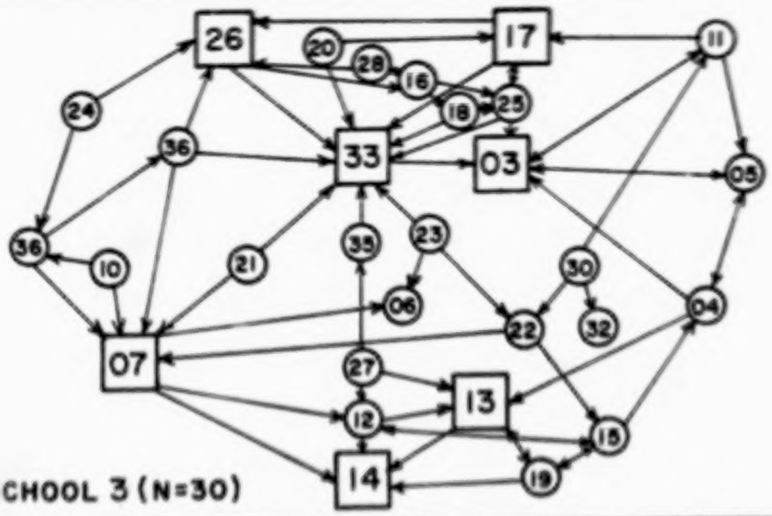
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FIGURE 1-C: SCHOOL 3 (N=30)

LEGEND: □ : OPINION LEADER ◯ : PRIMARY LIAISON △ : SECONDARY LIAISON ○ : TEACHER

FIGURE 1: SOCIOGRAMS OF (TEACHING) ADVICE COMMUNICATION NETWORK AMONG TEACHERS IN THE THREE SCHOOLS

had, in addition to a sizable number of isolates, a star structure in the main clique, with a circle-like network and a number of independent lines stretching out along the circle. Such intuitive examination of the communication networks suggested then that three very different group (teaching advice communication) structures existed in the three schools. To put these impressions to rigorous tests, the following indices were constructed:

NUMBER OF ISOLATES. An isolate was defined as the teacher who neither nominated nor was nominated by any other teacher sampled in the school. There were no isolates in School Three; there were three in School One (7%) and seven in School Two (19%).

NUMBER OF MINOR CLIQUES. A minor clique was defined as a subgroup of teachers who had no connections with the major clique (the major clique constituting the largest number of teachers who interacted with one another). The computational procedure is presented in Appendix "D." School Three had no minor cliques, School One had three and School Two had one.

NUMBER OF OPINION LEADERS. An opinion leader was defined as a teacher who was nominated by more than 10% of his fellow teachers. School Three had seven opinion leaders (Teachers 33, 17, 03, 07, 14, 13 and 26 in Figure 1-A). School One had two (Teachers 44 and 29) and School Two had one (Teacher 13).

NUMBER OF PRIMARY AND SECONDARY LIAISONS. A primary liaison was defined as a teacher whose absence from the group structure would break one connected group into at least two separated subgroups, each consisting of at least two teachers. A secondary liaison was defined as a teacher whose absence, paired with the absence of another teacher, would break one connected group into at least two separated subgroups, each consisting of at least two teachers. A primary liaison cannot be counted as a secondary liaison and secondary liaisons must exist at least in pairs. There were no liaisons, either primary or secondary, in School Three. In School One, Teacher 27 was a primary liaison and Teachers 29, 50, 57 and 38 were secondary liaisons. In School Two, Teachers 15, 31, 32, 40, and 42 were primary liaisons, and Teachers 45, 19, 23, 30, 05, 03, 13, 01 were secondary liaisons.

We have, in this section, seen some basic properties in the communication networks. Differentiation of the three structures was made in terms of isolation, minor cliques, opinion leader concentration, and liaisons whose absence could considerably increase the communication cost for some other teachers in the structure. In the next section, I will discuss measurements of teachers' influence and prestige in terms of the communication structure and I will try to determine whether influence and prestige were also consistent with innovativeness of the teachers in the schools.

Influence Domain, Centrality and Prestige

Three concepts will be indexed here. The first, the influence domain of a member in a social system, is defined as the extent to which the opinion of the member is sought, both directly and indirectly, by other members in the system. Operationally, a teacher's influence domain is measured in terms of the percentage of his fellow teachers who could be affected, directly or indirectly, by his opinions.

When Teacher "A" seeks advice from Teacher "B," we may say that Teacher "B" exerts some influence on Teacher "A." In the sociograms in Figures 1-A, 1-B, and 1-C, such relationships are indicated by the directions (note arrows). In addition to the direct influence which Teacher "B" may exert on Teacher "A," there is also the indirect influence he exerts on Teacher "C" if Teacher "C" is influenced by (seeks advice from) Teacher "A." This indirect influence of "B" upon "C" can be shown as C → A → B. The direction of the arrow indicates the direction of the influence. Thus, influence domain of a teacher was defined as the number of teachers to whom he provided advice upon request or whom he influenced indirectly.

The concept centrality was introduced to further index the communication cost implied in the length (number of steps or links) of the communication routes (or chains). The centrality of a member in a social system is defined in terms of the length of the communication chains involved in his influence domain. Operationally a teacher's centrality was the average number of links (steps) involved between himself and those teachers in the school who were under his influence domain. To compute Teacher "A's" centrality, for example, we first discovered which other teachers were under his influence domain. Then the number of links in the communication chain from Teacher "A" to each teacher in his influence domain was computed. Finally, to index Teacher "A's" centrality, the average number of links in all existing communication routes (chains) from other teachers to Teacher "A" was computed.

To measure the importance of a given member in the communication structure, we needed an index which took into account both his influence domain and his centrality in the structure. Prestige of a member, then, was defined as the extent to which he enjoyed high influence domain and centrality. Operationally, the prestige of a teacher was defined as his influence domain divided by the product of his centrality and the number of other teachers (N-1) in the school. Prestige could range from 1 (most prestigious) to zero (least prestigious). Computational procedures of these indices can be found in Appendix "D."

To find the influence domain of the teachers, a distance matrix was called for. A distance matrix (Ross and Harary, 1952, pp. 195-208) has in each of its cells either (1) a positive integer indicating the number of chains in the shortest influence route between the two teachers, or (2) an ∞ (infinity) if such an influence route does not exist between the two teachers. Such a matrix can be obtained by applying matrix multiplication on the incidence matrix (the incidence matrix shows the communication network). A computer program including a routine to find the distance matrix for a given communication network (in incidence matrix form) was written and operationalized on IBM 7094 at the Johns Hopkins Computing Center. The main output features of the program at the present time include: (1) the distance matrix, (2) the influence domain of each element, (3) the centrality of each element (defined as the sum of all chains in the influence domain divided by the influence domain). The three communication network matrices of the schools were fed into the program to find the influence domain and centrality of each teacher (Results presented in Appendices "B" and "C"). Finally, each teacher's prestige was computed.

The influence domain, centrality and prestige of the opinion leaders are presented in Table 3. We see here that the opinion leaders in School Three not only had greater influence domain, but also tended to enjoy higher prestige than did those in School One. As indicated earlier, there was no opinion leader in School Two; the most prestigious teacher (03) in the school obtained a score 0.140, far below those enjoyed by opinion leaders in Schools Three and One. Five of the seven opinion leaders in School Three obtained a prestige index of more than 0.250, as did one of the two opinion leaders in School One.

The data indicated that each teacher can be indexed, relative to the communication structure in a given school, in terms of his influence domain (extent of his advice-giving activities), his centrality (communication effort or cost involved in his exerting such influence) and his prestige (a function of his influence domain and centrality) in the school structure. Looking across schools, we find that differential results appeared. Opinion leaders in School Three exerted greater influence on their colleagues and enjoyed higher prestige than did those in Schools One and Two.

TABLE 3. Influence domain, centrality and prestige of opinion leaders.

Opinion Leader	Communication Indices		
	Influence Domain	Centrality	Prestige
School 3 (N = 30)			
Teacher 03	26 (87%)	2.27	0.395
Teacher 33	26 (87%)	2.85	0.315
Teacher 17	26 (87%)	3.12	0.288
Teacher 13	26 (87%)	3.31	0.271
Teacher 14	27 (90%)	3.44	0.270
Teacher 26	26 (87%)	3.65	0.246
Teacher 07	8 (27%)	1.38	0.200
School 1 (N = 42)			
Teacher 44	20 (48%)	1.60	0.305
Teacher 29	17 (40%)	1.82	0.227
School 2 (N = 37)			
Teacher 13	8 (23%)	1.88	0.119
Teacher 03*	11 (30%)	2.18	0.140

*Teacher 03 was the most prestigious teacher and is presented here for comparative purposes.

SUMMARY AND DISCUSSION

In this report, I tried first to indicate the relationship between conceptual schemes and research methods. Using a simplified and probably exaggerated example of a "typical" diffusion study, I pointed out the conceptual as well as methodologial characteristics of such a study. Then, I proceeded to suggest a process view of the diffusion phenomenon and presented a number of neglected areas in diffusion research, among them the decision-making process, the gatekeeping functions, implementation of the innovation, and effects and consequences of the innovation. These conceptual reorientations led the discussion into "innovative methods" including the field experiment, computer simulation and structural analysis.

I then reported a study of a structural analysis of innovation diffusion among teachers in three Michigan high schools.

The data, summarized in Table 4, suggest that the educational organization (School Three) with the highest degree of innovation internalization and smallest variability in first awareness among the members (teachers) had a communication structure (wired wheel) superior to those (satellite and star structures) of the other two educational organizations. The superiority of the organization (School Three) is reflected by the fact that it had (1) no teachers who were isolated or disconnected from the communication network, (2) no minor cliques separated from the main network, (3) no primary or secondary liaisons (which meant that the absence of one or two teachers, regardless how crucially positioned they might be,

TABLE 4. Comparisons of structural differences in the three schools.

Structural Property	School 1 (N = 42)	School 2 (N = 37)	School 3 (N = 30)
Number of isolates	3 (7%)	7 (19%)	0 (0%)
Number of minor cliques	3 (7%)	1 (3%)	0 (0%)
Number of opinion leaders	2 (5%)	1 (3%)	7 (23%)
Number of primary liaisons	1 (2%)	5 (14%)	0 (0%)
Number of secondary liaisons	4 (10%)	8 (22%)	0 (0%)
Maximum influence domain obtained by a teacher	20 (48%)	11 (30%)	27 (90%)
Maximum prestige obtained by a teacher*	0.305	0.140	0.395

*The maximum possible prestige was 1.00.

could not break the network into cliques). The tightly knitted structure (of School Three) was also evident in the number of opinion leaders whose influence domain covered nearly 90 percent of all members (teachers) and who enjoyed relatively high prestige among fellow members (teachers).

This preliminary study demonstrated that the diffusion phenomenon within organizations (schools) may be explained and predicted from certain structural properties. Further development along this line, such as complete inclusion of all members in the organization (which we failed to achieve in this study) promises to yield some powerful structural predictors for the process of innovation diffusion predictors which are more precise than the correlational or number of "opinion leaders" approaches utilized so often in diffusion research (Coleman, 1964, Ch. 14). Now, we should and can make an effort to study especially those who play liaison roles in the structure and who enjoy high prestige among fellow members in the structure. These are the persons who play important roles in determining the structure's communication cost which, in turn, is directly relevant to the introduction of and receptivity to the innovation in the social system.

What implications can such structural analysis have for educational organizations or policy makers attempting to innovate? There are at least three possibilities which I feel bear mentioning.

One, such structural analysis can provide information about the optimal process for disseminating new ideas and practices within an educational system. For example, to diffuse new educational practices and ideas into School One, Teachers 44 and 29 who enjoyed the highest prestige among the teachers should be initially invited to participate in discussions about these innovations and should be persuaded to support the use of the innovations in the school. In other words, the structural analysis should indicate who the gatekeepers are in an educational system and how they influence fellow workers. The organization if it hopes to have the innovation successfully introduced and implemented should strive to win over their support.

Two, the structural analysis may provide some information as to the compatibility between formal and informal structures in an educational system. When the two structures are found to be rather incompatible, it may be construed as a warning that conflict and failure will result if the innovations are disseminated through the formal structure. This may be the case regardless of how well the innovations may be intended for the system.

Finally, in addition to the advantage to us of being able to utilize the existing structure for optimal diffusion, such analysis may further be used to improve the structure for innovation assimilation. School Two in our study, for example, is shown to be very inefficient for innovation assimilation. The responsible persons in the system should be advised of the situation and recommendations should be made as to how such structure might be changed socially and physically. It is crucial, too, to think of ways to bring the isolated teachers into the main clique. Communication among the teachers should somehow be made more frequent and regular. New routes of communication should be created among teachers. These changes could be achieved, for example, by the rearranging of the teachers' offices or by creating a working hall for all teachers.

We are still quite far from achieving a clear picture of the diffusion process of educational innovations. But as we widen our conceptual scope and utilize "innovative" methods to study the various crucial components, we should begin to understand the structure and the substance involved in the process and to discover ways of tackling the various problems and barriers. It is with this consideration in mind that I hope this report has initiated a fresh methodological strategy and conceptual framework for studying educational innovations in particular and educational change in general.

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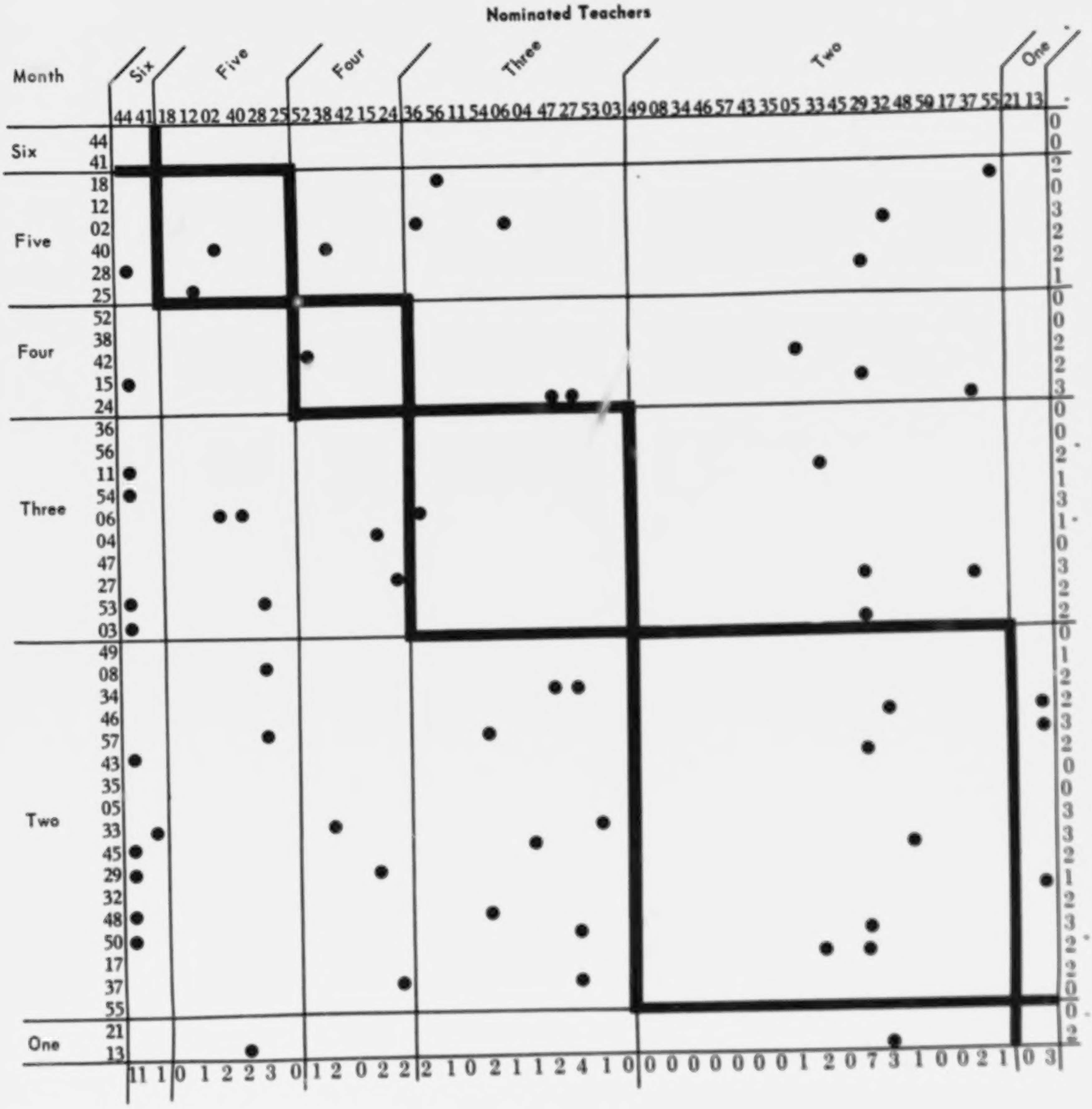
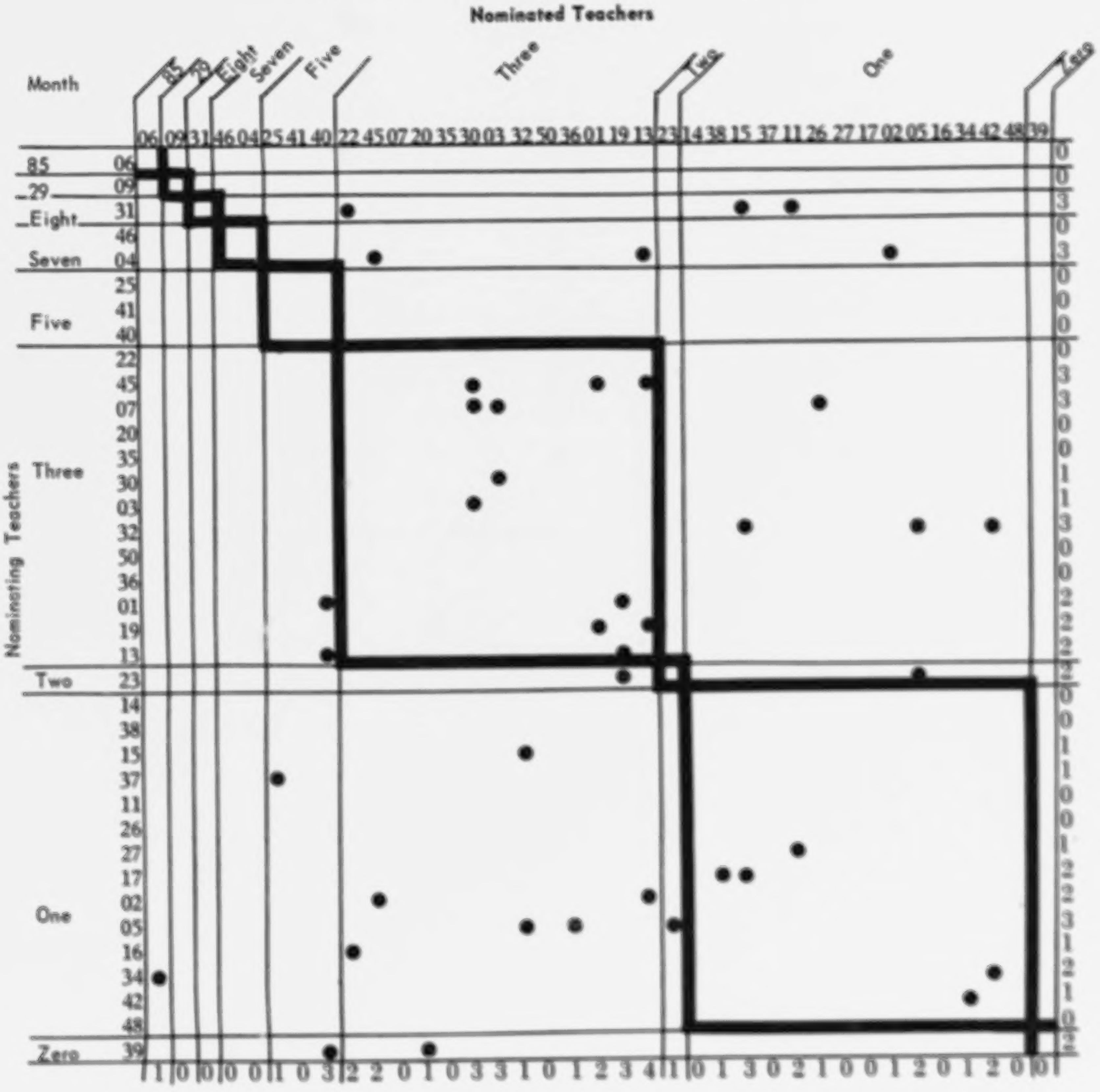
APPENDICES

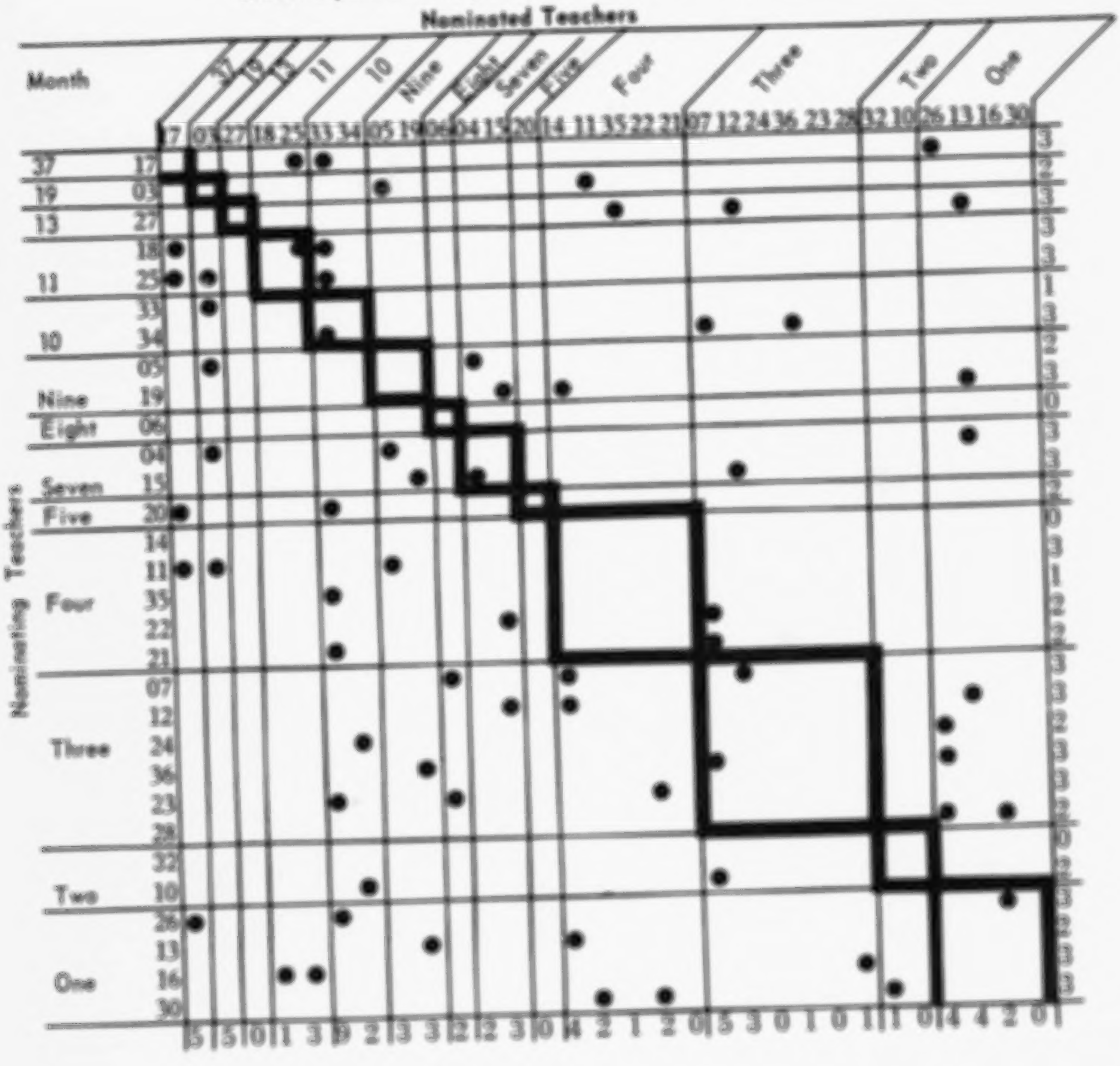
APPENDIX A-1: The Communication Matrix for Teachers in School 1 partitioned by Earliness of Innovation Awareness



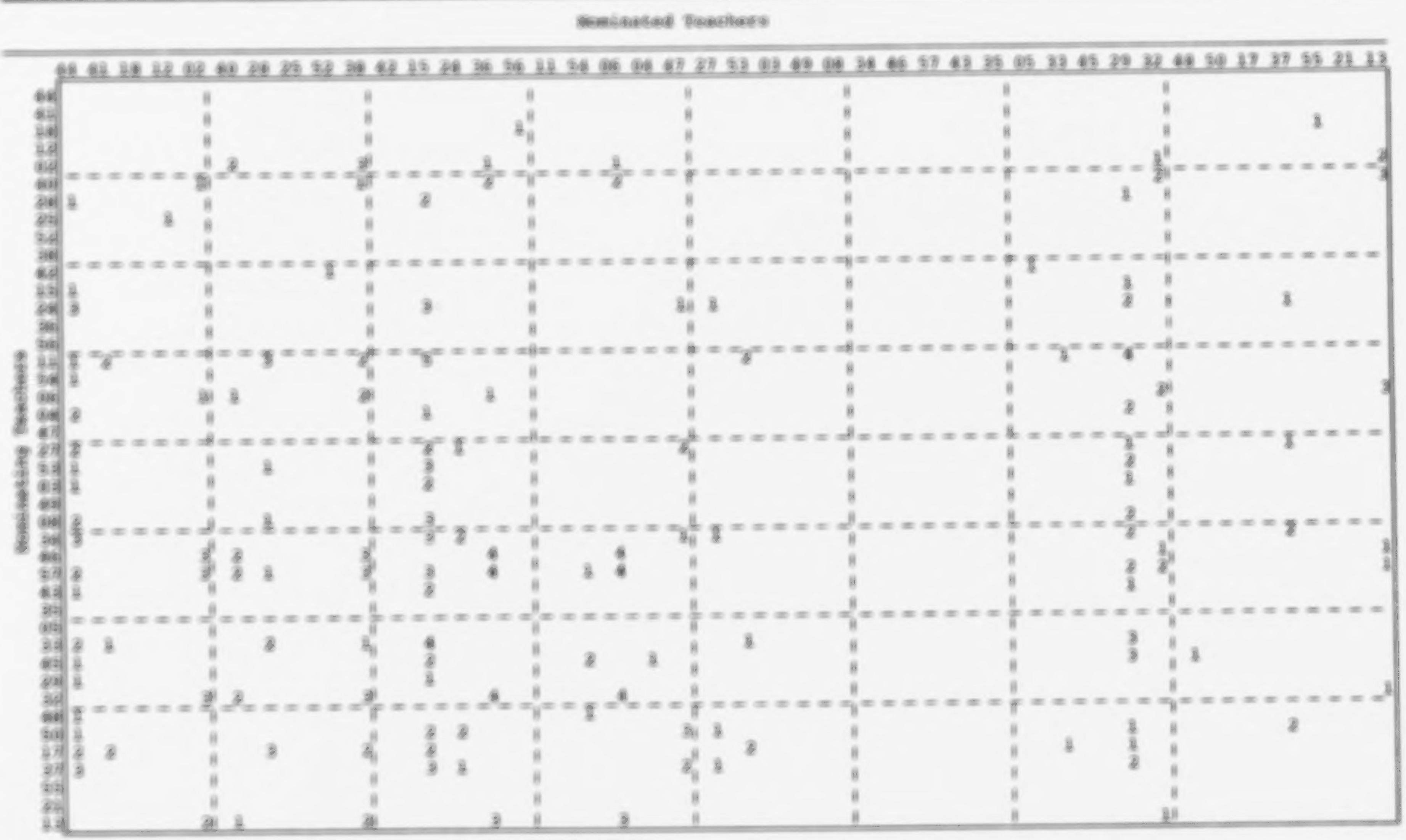
APPENDIX A-2: The Communication Matrix for Teachers in School 2 partitioned by Earliness of Innovation Awareness



APPENDIX A-3: The Communication Matrix for Teachers in School 3 partitioned by Earliness of Innovation Awareness


Nominated Teachers
Month
37
19
13
11
10
Nine
Eight
Seven
Five
Four
Three
Two
One
17 03 27 18 25 33 34 05 19 06 04 15 20 14 11 35 22 21 07 12 24 36 23 28 32 10 26 13 16 30
Nominating Teachers
5 5 0 1 3 9 2 3 3 2 2 3 0 4 2 1 2 0 5 3 0 1 0 1 1 0 4 4 2 0

APPENDIX B-1. The distance matrix for teachers in School 1.


Nominated Teachers
Nominating Teachers

APPENDIX B-2. The distance matrix for teachers in School 2.

	Nominated Teachers																																				
Nominating Teachers	06	09	31	66	04	25	61	60	22	65	07	20	35	30	03	32	50	36	01	10	13	23	14	38	15	27	11	26	27	17	02	05	16	34	42	48	39
06																																					
09																																					
31									1					3	2										1		1										
66																																					
04								2		1				2	3				2	2	1										1						
25																																					
61																																					
60																																					
22																																					
65								2						1	2				1	2	1																
07														1	1													1									
20																																					
35																																					
30															1																						
03														1																							
32	3							5						3	2			2	4	3	4	2			1							1		2	1		
50																																					
36																																					
01								1												1	2																
10								2											1		1																
13								1											2	1																	
23	5							3						5	4	2		2	2	1	2				3							1		4	3		
14																																					
38																																					
15														2	1																						
27							1																														
11																																					
26																																					
27																											1										
17														3	2									1	1												
02								2		1				2	2				2	2	1																
05	4							4						4	3	1		1	3	2	3	1			2									3	2		
16									1																												
34	1																																		1		
42	2																																	1			
48																																					
39								1				1																									

APPENDIX B-3. The distance matrix for teachers in School 3.

Nominated Teachers

Nominating Teachers	17	03	27	18	25	33	34	05	19	06	08	15	20	14	11	35	22	21	07	12	24	36	23	28	32	10	26	13	16	30
17		2		3	1	1		3	6		4	7		6	3					8				3			1	5	2	
03	2			5	3	3		1	4		2	5		4	1					6				3			3	3	4	
27	5	3		8	6	2		4	2		3	2		2	4	1				1				8			6	1	7	
18	1	2			1	1		3	6		6	7		6	3					8				4			2	5	3	
25	1	1		4		1		2	5		2	6		5	2					7				4			2	4	3	
33	3	1		6	4			2	5		3	6		5	2					7				6			4	4	5	
34	3	2		4	4	1		3	2	2	4	3		2	3				1	2		1		4			2	3	3	
05	3	1		6	4	4			3		1	4		3	2					5				6			4	2	5	
19	5	3		8	6	6		3			2	1		1	4					2				8			6	1	7	
06																														
08	3	1		6	4	4		1	2			3		2	2					4				6			4	1	5	
15	4	2		7	5	5		2	1		1			2	3					1				7			5	2	6	
20	1	2		4	2	1		3	6		4	7		6	3					8				4			2	5	3	
14																														
11	1	1		4	2	2		1	4		2	5		4						6				4			2	3	3	
35	4	2		7	5	1		3	6		4	7		6	3					8				7			5	5	6	
22	5	3		8	6	6		3	2	2	2	1		2	4				1	2				8			6	3	7	
21	4	2		7	5	1		3	4	2	4	3		2	3				1	2				7			5	3	6	
07	6	4		9	7	7		4	3	1	3	2		1	5					1				9			7	2	8	
12	5	3		8	6	6		3	2		2	1		1	4									8			6	1	7	
24	2	3		3	3	2	1	4	3	3	5	4		3	4				2	3		2		3			1	4	2	
36	2	3		3	3	2		4	1	2	3	2		2	4				1	2				3			1	2	2	
23	4	2		7	5	1		3	3	1	3	2		3	3		1		2	3				7			5	4	6	
28	2	3		2	2	2		4	7		5	8		7	4					9							1	6	1	
32																														
10	4	3		5	5	2	1	4	3	2	4	3		2	4				1	2		2		5			3	3	4	
26	1	2		2	2	1		3	6		4	7		6	3					8				2				5	1	
13	6	4		9	7	7		4	1		3	2		1	5					3				9			7		8	
16	2	2		1	1	2		3	6		4	7		6	3					8				1			2	5		
30	2	2		5	2	3		2	3	3	3	2		2	1		1		2	2				5	1		3	4	4	

APPENDIX C-1. Influence domain and centrality of teachers in School 1.

Teacher	Influence Domain	Centrality*	Prestige
44	20	1.60	0.305
41	3	1.67	0.044
18	0	=	0.000
12	1	1.00	0.024
02	6	2.17	0.068
40	6	1.67	0.088
28	6	1.83	0.080
25	0	=	0.000
52	1	1.00	0.024
38	10	2.20	0.111
42	0	=	0.000
15	17	2.53	0.164
24	4	1.50	0.065
36	7	2.71	0.063
56	1	1.00	0.024
11	0	=	0.000
54	3	1.33	0.055
06	6	3.00	0.049
04	1	1.00	0.024
47	5	1.80	0.068
27	4	1.00	0.098
53	3	1.67	0.044
03	0	=	0.000
49	0	=	0.000
08	0	=	0.000
34	0	=	0.000
46	0	=	0.000
57	0	=	0.000
43	0	=	0.000
35	0	=	0.000
05	1	1.00	0.024
33	2	1.00	0.049
45	0	=	0.000
29	17	1.82	0.227
32	6	1.50	0.098
48	1	1.00	0.024
50	0	=	0.000
17	0	=	0.000
37	4	1.50	0.065
55	1	1.00	0.024
21	0	=	0.000
13	6	1.83	0.080

*The maximum centrality score is "1."

APPENDIX C-2. Influence domain and centrality of teachers in School 2.

Teacher	Influence Domain	Centrality*	Prestige
06	5	3.00	0.046
09	0	∞	0.000
31	0	∞	0.000
46	0	∞	0.000
04	0	∞	0.000
25	1	1.00	0.028
41	0	∞	0.000
40	10	2.30	0.121
22	2	1.00	0.056
45	2	1.00	0.056
07	0	∞	0.000
20	1	1.00	0.028
35	0	∞	0.000
30	11	2.45	0.124
03	11	2.18	0.140
32	2	1.50	0.037
50	0	∞	0.000
36	3	1.67	0.050
01	8	2.13	0.105
19	8	1.75	0.127
13	8	1.88	0.119
23	2	1.50	0.037
14	0	∞	0.000
38	1	1.00	0.028
15	5	1.60	0.087
37	0	∞	0.000
11	2	1.00	0.056
26	1	1.00	0.028
27	0	∞	0.000
17	0	∞	0.000
02	1	1.00	0.028
05	0	∞	0.000
16	0	∞	0.000
34	4	2.50	0.044
42	4	1.75	0.063
48	0	∞	0.000
39	0	∞	0.000

*See footnote--Appendix C-1.

APPENDIX C-3. Influence domain and centrality of teachers in School 3.

Teacher	Influence Domain	Centrality*	Prestige
17	26	3.12	0.288
03	26	2.70	0.395
27	0	∞	0.000
18	26	5.42	0.165
25	26	3.92	0.229
33	26	2.85	0.315
34	2	1.00	0.069
05	26	2.88	0.311
19	26	3.69	0.243
06	9	2.00	0.155
04	26	3.15	0.284
15	26	4.12	0.218
20	0	∞	0.000
14	27	3.44	0.270
11	26	3.15	0.284
35	1	1.00	0.034
22	2	1.00	0.069
21	0	∞	0.000
07	8	1.38	0.201
12	26	4.58	0.196
24	0	∞	0.000
36	3	1.67	0.062
23	0	∞	0.000
28	26	5.50	0.163
32	1	1.00	0.034
10	0	∞	0.000
26	26	3.65	0.245
13	26	3.31	0.271
16	26	4.54	0.198
30	0	∞	0.000

*See footnote--Appendix C-1.

APPENDIX D. Computational procedures for the incidence matrix, influence domain, centrality, prestige and clique identification.

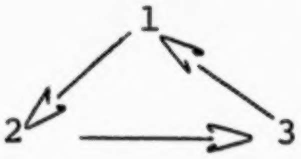
Incidence Matrix and Distance Matrix

Sociometric data can be converted into a square incidence matrix in which the cells consist of values of 1's and 0's only. For a social system of n members, the matrix is an n by n matrix. Call this matrix A; then a_{ij} (row i and column j) is assigned a value of "1" if member i nominates member j and a_{ij} is assigned a value of "0" if member i does not nominate member j. The initial distance matrix, D, has also n by n cells, and an ∞ is assigned in all cells.

For instance, given the following initial incidence matrix and initial distance matrix:

$$A^1 = \begin{array}{cc} & \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \end{array} & \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{pmatrix} \end{array} \qquad D = \begin{array}{cc} & \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \end{array} & \begin{pmatrix} \infty & \infty & \infty \\ \infty & \infty & \infty \\ \infty & \infty & \infty \end{pmatrix} \end{array}$$

then, the network represented in A^1 can also be described in the following sociogram:



A^1, thus, shows the communication pattern of one-step (advice seeking) flow. We may say that member 1 exerts influence upon member 3, member 2 exerts influence upon member 1, and member 3 exerts influence upon member 2; all in one-step communication flow (or, direct influence). Then, we assign the value "1" (the number of steps) in cells d_{12}, d_{23}, and d_{31} in the distance matrix:

$$D = \begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{pmatrix} \infty & 1 & \infty \\ \infty & \infty & 1 \\ 1 & \infty & \infty \end{pmatrix} \end{array}$$

In order to determine who exerts influence upon whom after two steps of communication flow or advice seeking activities, we square the A^1 matrix to obtain A^2 matrix. We compute the values for each cell in A^2 with the operation of regular matrix multiplication first:

$$a_{ij}^{(2)} = (a_{i1}^{1} \cdot a_{1j}^{1}) + (a_{i2}^{1} \cdot a_{2j}^{1}) + \cdot \cdot \cdot \cdot + (a_{in}^{1} \cdot a_{nj}^{1})$$

$$= \sum_{k=1}^{n} (a_{ik}^{1} \cdot a_{kj}^{1})$$

Then:

$$a_{ij}^{2} = \begin{cases} 1, \text{ if } a^{(2)} > 0 \\ 0, \text{ if } a^{(2)} = 0 \end{cases}$$

Operating on the original matrix A^1 with the above formulas, we obtain matrix A^2:

$$A^2 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{pmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix} \end{array}$$

which indicates that after two steps of flow, the information or influence has been transmitted from member 1 to member 3 (via member 2), 2 to 1 (via 3), and 3 to 2 (via 1). Checking the distance matrix D against A^2, we find that the cells d_{13}, d_{21}, and d_{32} still have a value of infinity (∞). Thus, we assign a value of "2" (number of steps taken) into these cells. Now, the distance matrix D is:

$$D = \begin{array}{c|ccc} & 1 & 2 & 3 \\ \hline 1 & \infty & 1 & 2 \\ 2 & 2 & \infty & 1 \\ 3 & 1 & 2 & \infty \end{array}$$

Using the same procedure, we find that:

$$A^{(3)} = A^1 \cdot A^2$$

$$a_{ij}^3 = \begin{cases} 1, \text{ if } a_{ij}^{(3)} > 1 \\ \\ 0, \text{ if } a_{ij}^{(3)} = 0 \end{cases}$$

$$A^3 = \begin{array}{c|ccc} & 1 & 2 & 3 \\ \hline 1 & 1 & 0 & 0 \\ 2 & 0 & 1 & 0 \\ 3 & 0 & 0 & 1 \end{array}$$

and the distance matrix D becomes:

$$D = \begin{array}{c|ccc} & 1 & 2 & 3 \\ \hline 1 & 3 & 1 & 2 \\ 2 & 2 & 3 & 1 \\ 3 & 1 & 2 & 3 \end{array}$$

which indicates that the distance between any two members is completely known.* In general, the maximum number of multiplications to be performed is n-1. In order to assure that the distance between any pair is minimum, d_{ij} can be assigned an integer value of m if and only if:

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*When "direct feedback" (self-loop) is not a crucial variable in an investigation, the diagonal cells should be assigned a value of "0" at all times. In this paper, the diagonal cells assumed "0" in all distance matrices.

(1). $a^m_{ij} = 1$; and

(2). $a^k_{ij} = 0$ for all $k < m$

Influence Domain, Centrality, and Prestige of Members

Influence domain of member l (l_i) is defined as:

$$l_i = \sum_{\text{all } k} d'_{ki} \quad \text{where} \quad d'_{ki} = \begin{cases} 1, \text{ if } d_{ki} < n \text{ and } k \neq i \\ \\ 0, \text{ if } d_{ki} > n \end{cases}$$

Centrality of member i (C_i) is defined as:

$$C_i = \frac{\sum_{\text{all } k} d_{ki}}{l_i} \quad \text{where } d_{ki} < n \quad \text{and } k \neq i$$

And, prestige of member i (P_i) is defined as:

$$P_i = \begin{cases} \dfrac{l_i}{C_i \ (N-1)} & \text{when } C_i \neq 0 \\ \\ 0 & \text{when } C_i = 0 \end{cases}$$

Clique Identification

Cliques can be identified from the final distance matrix by the following procedure:

(1) First, select the member with the greatest influence domain:

$$b_1 = \max (l_i;\ i = 1, \ldots , n)$$

(2) Clique 1 (G_1) consists of all members who are under b_1's influence:

$$G_1 = \left\{ d_{i1};\ d_{i1} < n,\ i = 2, \ldots , n \right\}$$

(3) Then, select among the remaining members the member with the greatest influence domain:

$$b_2 = \max (l_i;\ i \text{ and } G_1)$$

(4) Clique 2 (G_2) consists of all members who are under b_2's influence:

$$G_2 = \left\{ d_{i1};\ d_{i1} < n,\ i = j, \ldots , n;\ \text{where } j = n\ (G_1) + 2 \right\}$$

(5) Repeat steps (3) and (4) to find all cliques and the remaining members are isolates.

For a symmetric incidence matrix, a number of members may possess multiclique memberships. However, if the incidence matrix is symmetric (assuming reciprocity of communication between any nominating and nominated pair), it will not occur. In this paper, symmetric matrices were used in identifying the cliques in the schools.

> It is my impression that no one really likes the new. We are afraid of it. It is not only as Dostoyevsky put it that 'taking a new step, uttering a new word is what people fear most.' Even in slight things the experience of the new is rarely without some stirring of foreboding. . . . In the case of drastic change the uneasiness is of course deeper and more lasting. We can never be really prepared for that which is wholly new. We have to adjust ourselves, and every radical adjustment is a crisis in self-esteem: we undergo a test, we have to prove ourselves. It needs inordinate self-confidence to face drastic change without inner trembling (Hoffer, pp. 1-2).

IMPLICATIONS FOR PRACTICE FROM RESEARCH ON EDUCATIONAL CHANGE

by

Richard I. Miller

Eric Hoffer adds a touch of realism to any discussion of change--especially for an audience of the converted! It is not an accident that human history is strewn with the wreckage of plans for change.

But change inevitably will come, as the ancient Ionian philosopher Heraclitus allegedly said: "One cannot put his foot in the same water twice." Our task at this conference is to understand this inevitability in order that we may guide and direct it into channels that will produce maximum impact with minimum consternation.

My paper will be directed to the societal, regional, and state dimensions of the change process. Other equally important levels of the process are the inter- and intra-institutional, the classroom, and the individual. The larger dimension, however, does present some interesting problems in information management and verification.

We begin an article of faith about research evidence rather than with the evidence itself simply because such evidence is non-existent for education. As pointed out by Louis Bright and Hendrik Gideonse:

> The improvement of American education depends upon the systematic investigation of the process and the necessary condition for learning, the development of instructional objectives, strategies, and materials based on the knowledge educators and others accumulate about the learning process, and finally on the implementation of those strategies and the use of those materials in instructional settings across the country (p. 89).

This is the hypothesis that underlies this paper. We cannot now prove its validity on a regional or national level, but we believe it to be so and, therefore, are willing to base programs upon its eventual verification--at least for awhile.

NEW FORCES FOR CHANGE

Moving from an article of faith to some analyses of the current educational scene, perhaps a convenient starting point might be one of the new major forces for educational change--the Elementary and Secondary Education Act of 1965 (ESEA). This act grew out of a special task force on education created by President Lyndon B. Johnson in the summer of 1964.* Chaired by John Gardner, then president of Carnegie Corporation and former Secretary of Health, Education, and Welfare (HEW), and staffed by a combination of university scholars, private citizens, and government officials, the task force was asked neither to resolve basic conflicts nor to write legislation, but rather to bring together varying streams of educational thought to form the basis of a fresh dialogue. The task force, with nonpublicized meetings and membership, was stimulated to "think big" without public constraint or professional bias.

Though the task force report has not been made public, the first draft of the 1965 ESEA, especially Title III, substantially reflected the general concepts and thrusts developed by the task force members. Two of these thrusts, in particular, became the seed for Title III.

THE FIRST--a stress on moving away from piecemeal support of small-scale individual projects to large-scale "model" institutions where concentrated resources could be brought together--reflected both a view and an assumption. It reflected the view that the wealth of new ideas and programs developed in the past 10 years had not produced substantial changes because neither the efforts to innovate nor the arrangements to disseminate innovative ideas were scaled adequate to need. It reflected an assumption that the basic problem was not so much having new ideas as converting them into forms usable in the classroom.

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*This section is based upon research by Doris Kearns and the author, and included in the report of the national study team for ESEA Title III (PACE). See U.S. Congress, 1967, "Chapter II--ESEA--A New Element," pp. 15-24.

THE SECOND THRUST was a stress on moving away from general aid grants to traditional educational institutions toward providing money to a series of outside institutions (non-profit private groups, local community centers, museums, State departments of education, etc.). It reflected the view that school systems were concerned primarily with meeting the exigencies of day-to-day operations and with keeping "what is" going smoothly, often stifling attempts to bring about change or to provide a new set of services beyond the basic educational services established over the years. Thus came into existence the idea of supplementary educational centers that would be financed by the federal government and staffed by artists, museum directors, novelists, journalists and the like--designed to bring about change and to provide new services from the outside in.

FROM TASK FORCE REPORT TO CONGRESSIONAL BILL

If the task force members did not need to anticipate congressional expectations and demands, the administration leaders responsible for drafting the bill did have to consider this reality. Thus through an endless series of conversations and memo exchanges, with then Commissioner of Education Francis Keppel--acting as broker between the HEW leadership, the White House Staff, the Bureau of the Budget, and outside interests such as the National Education Association (NEA) and the National Catholic Welfare Conference, and the key senators and congressmen--the visionary task force recommendations were hammered into legislative provisions with political viability.

The process of creating provisions viable both in the political and educational worlds involved major accommodations with three prominent factors in the political landscape; involved was fear of major federal intervention into education, religion, and race.

Fear of Federal Control

Fear of federal control, for example, was thought to be a crippling restraint on serious consideration of federally sponsored model institutions. Perhaps congressional antagonism could be overcome if model institutions were made only a minor part of a large-scale program that would be specifically designed to aid educationally deprived children at a time when concern about poverty had considerable political appeal. And by moving from unrestricted general aid to massive categorical aid for the poor, the NEA's traditional resistance could be mollified.

Thus ESEA Title I was born, although the idea was never really mentioned in the task force. It became the major title, and Title III--which was formed from the core of the task force recommendations--slipped into the background. To ward off potentially powerful opposition by state departments of education, Title V was developed. It provides a special allotment of money for strengthening state departments.

Church-State and Race Issues

With fears of federal control seemingly mollified, the delicate church-state issue still loomed ahead. A program of federally sponsored educational centers, run by private institutions and nonprofit schools as well as public institutions, would only serve to sharpen fears of church-state separatists. But if the heart of the program (Title I) was directed toward the public schools (thus avoiding the tricky constitutional question) with provisions for aiding private school children (thus gaining the Catholic support), then perhaps a small title (Title III) serving other institutions as well as public schools would not be so indigestible.

The third force--race--was effectively removed from the federal aid question by the Civil Rights Act of 1964 requiring the desegregation of all hospitals and schools receiving federal money. This act solved the past dilemma of the government being able to neither support segregation by providing aid to segregated schools nor to reject southern votes by refusing aid to segregated schools.

When President Johnson delivered his educational message on January 12, 1965, outlining the basic five titles of his proposed education bill, it seemed as if the basic cleavages renting apart the supporters of federal aid in the past had been significantly closed.

The ESEA has accounted for three innovative thrusts that are prominent among new forces for change. I would like to move into two of these--Title III, better known as "PACE," and the Regional Educational Laboratories (REL's) aspect of Title IV. Then, a pre-ESEA development--the Research and Development Centers--will round out recent federal developments. Of course, there are others, such as ERIC, long range policy planning centers, and ESEA Title I, and their exclusion is not a reflection upon their importance but upon limitations in scope and time.

THREE INNOVATIVE THRUSTS

ESEA Title III (PACE)

While details of the PACE program can be found elsewhere (U.S. Congress, 1967),* a summary tally of strengths and weaknesses might be useful at this point.

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*Also see the June 1967 issue of Theory Into Practice (TIP) which focuses on PACE.

Strengths: 1. Title III is creating a groundswell of thought about new ideas and developments in American education.

2. Cooperation among educators as well as with those outside the profession, in itself, has been worth the investment. The parochialism of educational cooperation is being breached by the Title III requirement that educators and others plan together for educational improvement.

3. Title III maintains that many outstanding ideas and programs remain dormant at the local level because no one really cares. Large and small foundations and other monies have largely bypassed the local school systems in favor of the university or other organizational approaches.

4. PACE is helping generate educational initiative at the local scene.

5. PACE is stimulating some exciting and inventive ideas that may serve future educational needs very well.

6. PACE is helping bring about a re-examination of pre-service and in-service teacher education.

Weaknesses: 1. Most projects do not demonstrate a familiarity with the literature related to their focus--or if a familiarity, not a grasp of it.

2. Inadequate definition of the needs in most of the proposals is a glaring weakness.

3. The "needs" inadequacies are related directly to lack of clear objectives.

4. The proposals are very weak in evaluation.

5. Lack of dissemination and implementation provisions is another obvious inadequacy.

6. Lack of trained personnel skilled in various aspects of the change process is very evident.* As pointed out by Everett Rogers (1967, p. 147),

> . . . the major difficulty with the design of Title III activities is the fact that the development, adaptation, field testing, and dissemination of educational innovations, which are highly sophisticated tasks, are to be attempted by persons who lack sophistication in research, evaluation, and diffusion tasks.

Regional Educational Laboratories

The most unique educational invention of the 89th Congress was the REL's. This innovation was based upon the assumption that no single existing institution was strategically located or empowered to relate effectively all segments of the quality educational change; therefore, it was necessary to design something new to stimulate an extensive partnership of individuals and agencies with a wide variety of jurisdictional responsibilities to tie research and development more closely to classroom practice. Together with the Research and Development Centers, to be mentioned later, the REL's now constitute a National Program of Educational Laboratories.

Initially, the REL's were set up to (1) conduct educational research, (2) provide facilities and equipment for research, (3) carry out the training of individuals for leadership in such activities, (4) translate the findings of research into feasible education practices and programs, and (5) assist in the implementation of productive change by disseminating innovative programs and practices throughout the region being served (Miller, 1966).

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*For further elaboration of these points, see Miller, 1967.

This early focus has been narrowed now so that "educational development is the name of the game." Quoting further from a paper by Norman Boyan (1968), director, Division of Educational Laboratories, USOE:

> Examples of near fit (as far as describing 'development') include features of the major curriculum programs in the sciences and in mathematics that blossomed in the late 1950's and of scattered efforts in the field of structural innovation, such as the Flexible Scheduling Project at Stanford University. These examples share in common the goal of making educational ideas and inventions work. The developers in each instance assumed the responsibility for carrying their ideas to the drawing board to create specific materials and processes, taking them from the drawing board to the field for tryout, returning to the drawing board with the results of their field testing, returning to the field with more refined materials and processes, again and again. This iterative process both characterizes and constitutes an essential feature of developmental work.

The 20 regional laboratories, however, have developed quite different program thrusts. The Center for Urban Education is developing strategies for introducing into urban school systems, on a mass basis, instructional programs which would insure early literacy; the Central Atlantic Regional Educational Laboratory is developing teaching materials in art, music, theater, dance, and literature for students from the ages of three to eight; and the Research for Better Schools is field testing, monitoring, and developing further the Individually Prescribed Instruction System (IPI). A preliminary content analysis of the programs listed for the 12 operational REL's showed a total of 152 programs in 86 categories. The largest single category of interest--the culturally deprived--will surprise no one.

The focus on development is open to question. It seems that one needs to begin with a question such as: With its limited resources and with the spirit of the program, what kinds of activities can the REL's undertake to have optimum impact upon learning? One can question whether the limited financial resources available will allow the type of large scale and extensive research that is needed if development is to be more than a series of modest and hopeful projects.

Two of the greatest needs in American education are effective implementation of good ideas and training of evaluators. These two functions might be more appropriate major thrusts than development.

How does one evaluate the REL's? Certainly they have been evaluated by a variety of means. Research on evaluation does not assist us much here. We simply have not interested research evaluators in this type of messy and confusing problem. There exists a definite need for developing research procedures for such evaluation.

Research and Development Centers

The Research and Development Center Program was established in 1963 under the Cooperative Research Act. It was, in essence, a response to at least three major concerns that had built up with respect to prior efforts in educational research and development.

In the first place, previous efforts tended to be small scale and fragmented and consequently the results were neither conclusive nor cumulative.

Second, there was a concern about the gap between research and practice. Research results were not being used as a basis for developing new educational materials or practices, and such products as were developed were slow to be adopted in large numbers of schools.

Third, it was recognized that the field of education had not attracted the necessary research resources from the behavioral sciences and other disciplines, and their active involvement with educational problems was highly desirable.

Basically an R-and-D Center is an organizational device designed to supplement other forms of educational research and development and overcome these problems. The central notion is that of bringing together a critical mass of interdisciplinary talent and other resources (1) to focus on a significant educational problem and (2) to design and conduct, on a coordinated and interrelated program of basic research, applied research and development which will move toward the solution of that problem in a cumulative manner. Generally the process will be carried to the point of a pilot try-out of innovations in a field setting, and centers are responsible for disseminating the results of their work to specialized audiences.

Nine R-and-D Centers are now in operation with a variety of programs. For example, the Learning Research and Development Center at Pittsburgh is studying interaction between learning research in the behavioral sciences and instructional practices in the schools; the Center for the Advanced Study of Educational Administration at the University of Oregon is studying the social context in which educational institutions operate; and the Wisconsin Research and Development Center for Cognitive Learning at the University of Wisconsin is focusing upon improvement of educational practices through a better understanding of cognitive learning.

The R-and-D Centers are established on a long term basis and therefore short term gains should not be expected. A close check needs to be given about every third year, however, to see whether the centers are moving toward their objectives. A tendency may develop in some centers for the programs to become almost indistinguishable aspects of the university's program.

These three federal programs, as mentioned earlier, constitute only a relatively small outlay of money--around $200 million this year--but they do represent distinctly new thrusts for educational improvement.

CONCERNS ABOUT FEDERAL ROLE

But all is not well at the federal level. For one thing, a suspicion of the role of Congress is developing among an increasing number of educators. Without at all denying the fundamental role of Congress in educational matters, educators are becoming increasingly concerned about the political nature of some important recent decisions on educational matters.

We have almost no research on this problem, and we need to know much more about how key decisions were really made. Fortunately, interest has been developing recently in this type of case study research.

We are in great need of more intelligent approaches to a new major federal legislation on education. Two types of studies are needed. One would view the entire national educational system as an input-process-output model. And a second study would view the various federal programs as a subsystem, analyzing the various titles in terms of how much attention they give to research, development, production (programs), evaluation, demonstration, dissemination, and implementation.

The "Experimental Schools Act"

Based upon this type of analysis, I would like to suggest what I believe to be the next major federal thrust in education--the *Experimental Schools Act*. While more details may be found in a guest editorial in the April issue of the *Phi Delta Kappan* magazine, let me briefly outline the idea:

Amidst unprecedented expenditures for education at all levels we are continuing to tinker around with bits and pieces of research and evaluation. We are continuing to talk about "comprehensive models for education"--pre-school through junior college sequences--but without seriously considering comprehensive models for experimentation and evaluation. With business and industry now spending over $1 billion annually on the development of educational technology, and with the cutting-edge thinkers in education advocating synthesis of various innovations such as nongradedness, teacher aides, team teaching, and flexible scheduling, do we have any alternative but to experiment on a comprehensive scale?

Where can we turn, then, for the extensive, comprehensive, and interrelated educational research and evaluation that also will be needed? I believe that the U.S. Congress should establish a network of 50 experimental schools across the nation patterned after the well-known and highly successful agricultural experimental stations.

Under such an act, schools would be established in all geographic areas and would specialize in various educational problem areas. All schools would be linked by telephone and closed-circuit television. Semi-annual meetings of selected faculty members and administrators on task-oriented jobs would help tie the schools together by providing professional incentives and facilitating communication.

The Experimental Schools Act, in essence, would be a systems approach to the problems of education. Not only would it allow the type of interrelated research and development of management systems that are essential next steps in our era of energetic innovation, but it would allow educational problems to be studied vertically over a 12- or 14-year period.

Who would support this? The federal government would need to play a major role.

With the possible exception of the California and New York state departments of education, the vast majority of them are not set up to foster experimentation and innovation of the experimental school sort. State departments, however, should have a definite part in the total pattern of funding and control.

Private industry should have a role both in terms of financing and in terms of manpower contributions. The January 1967 issue of the Phi Delta Kappan with its focus on business and education adds perspective to this dimension.

One might ask: Why cannot present educational institutions do the job? Let us examine them. University laboratory schools too often are baby-sitting operations for professors' children with some observational functions and a few pieces of research, but they have neither the resources nor the inclination to do comprehensive, long-term research.

Public schools and leagues of public schools such as sponsored by I/D/E/A or AIR (American Institutes for Research in the Behavioral Sciences) can make valuable piecemeal contributions, but the public schools simply are too subject to local pressures and whims to undertake comprehensive and experimental studies on a long-term basis.

A few promising linkages are developing between universities (Harvard and Columbia University

Teachers College in particular) and selected public schools, but these necessarily will be limited and often inadequate because of cross-purposes, inadequate finances and personnel, and local sensitivities.

The Oakleaf Elementary School in the Pittsburgh school system comes reasonably close to an experimental school but it is operating only at the elementary level and is focusing exclusively upon individually prescribed instruction (IPI). The Oakleaf school project is directed by the Research and Development Center at the University of Pittsburgh.

Regional educational labs can assist in some development and dissemination work but these operations are usually multi-state service and/or development centers that are not designed, equipped, nor financed to carry on the extensive type of operation envisaged in the Experimental Schools Act.

The act could establish 50 schools supported under a 75-15-10 formula, perhaps, with the federal government financing 75 percent of the cost; private industry and philanthropic foundations, 15 percent; and the states, 10 percent. A national board would have genuine power, buttressing the schools against becoming captives of any one funding source and providing necessary flexibility in the program. Buildings, equipment, and maintenance would be solely financed by government as authorized in the Experimental Schools Act.

Students would be selected on a volunteer basis, with careful consideration given to socio-economic spread. Full accreditation of the programs would be a relatively simple matter since state participation would be voluntary.

An imaginative, adequately-financed Experimental Schools Act would not be cheap--roughly one-half billion dollars for the first five years to take care of major construction and equipment costs, and one-quarter billion dollars per year thereafter. If this sounds unrealistic in view of accelerated state funding and Vietnam, one should look back just three years to gain some perspective.

Also, one should ask: What is the alternative to something akin to the Experimental Schools Act? Can we afford the probably misleading generalizations from piecemeal data about putting innovations together for comprehensive and long-term study? I believe that something along the line of a comprehensive experimental school will become part of the American educational scene--if we are to make the major breakthroughs which the future will demand.

A "CED-Like" Organization

May I suggest a second type of new national organization that seems to grow out of many forces and trends in American education--perhaps succinctly captured by Lawrence Cremin (1965, p. 31) when he said, " . . . it will do Americans little good to quicken their pace in education if they do not know where they are going.

This would point to the need for a "CED-like" Organization in education--a distinguished, impartial, wise body that would speak out on important educational issues and concerns. The Committee on Economic Development (CED) was formed in 1948 to give business and industry a clearer picture of its own problems and issues and to assist the government in understanding these points of view. We definitely need such an organization in education. It could include representatives from foundations, government, industry, and labor as well as from education. Funding could be from foundations, government, industry, and labor. Some preliminary probings into the possibility of such an organization are now underway.

STATE DEPARTMENTS OF EDUCATION

The role of state departments of education in education is very old, and yet it is new in size and importance. The very fact of this conference attests to this. In his book, *Shaping Educational Policy*, James B. Conant (1964, p. 15) states that "citizens in most states should be as much concerned with what goes on in the capital of their state as with what goes on in Washington"; Franklin D. Roosevelt, speaking before an Atlanta Rotarian luncheon last year said that his 20 years in Washington taught him that the federal government almost always moves into a vacuum; and in his inaugural address the Governor of the State of Washington said that state governments are on trial as never before with greater unparalleled opportunities--and it may be their last chance if they do not succeed.

Most state departments presently have two primary functions, when one boils down a great many activities. These are a maintenance and a coordination function. Maintenance includes stability--and, as Virgil Blanke (1967, p. 291) pointed out in his address before one of Edgar Morphet's three conferences on designing education for the future,

> change and persistence . . . are universal features of any culture; furthermore, they are reciprocals of the same phenomena of cultural dynamics. Consequently, when one discusses change, he also considers persistence whether he realizes it or not.

For the future, three additional functions will be essential if state departments are to keep ahead of demand. These include short and long-term planning, evaluation, and dissemination. Obviously some state departments are performing well in one or more of these areas, but the majority are not. Before turning to needed research, I would like to suggest some functions that are not appropriate for state departments of education in view of (1) their ongoing, pressing concerns, (2) the nature of their personnel, and (3) other institutions for the job. These include: preparation of curriculum guides, basic and applied research, sizable development projects, and demonstrations.

NEEDED RESEARCH

IN THE AREA OF PLANNING, every state in the nation should undertake an extensive "needs assessment" study at periodic intervals. The key is extensive--probably costing $250,000 or more for a medium-sized state. Most states have little more than a half-hearted, confusing accumulation of educational statistics with little or no effort to do the quality of study that can serve as an input for educational decision-making.

IN THE AREA OF EVALUATION, every state should make serious studies of the quality of education--and at periodic intervals. (The state department might want to subcontract studies of this nature.)

Such a study is now possible--at least we have just completed one for the State of Kentucky. We call ours "a system analysis of education in Kentucky public schools."*

A System Analysis of Education

Believing that the "calibrated eyeball" approach was too gross and that sole reliance upon test scores was too confining, a study team has utilized a cost-benefit and system analysis approach. These findings are the result of an inquiry into the question: How can a school district determine whether it is receiving a reasonably effective educational return for dollars spent?

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*Research by Richard I. Miller, Director, Program on Educational Change, University of Kentucky, and two co-workers, William Diamond and Charles F. Martin, Sr.

The material for this section is taken from a publication by the three investigators entitled: Quality Rankings of Kentucky Public School Districts, Bureau of School Service, University of Kentucky, March, 1968. A second report entitled Methodology for Assessing the Quality of Public Education is being completed.

Note: Extreme care should be taken in attempting to transfer findings of this Kentucky study to any other state.

Quality public education has never been more vigorously espoused and sought than at present. The increasing complexity of occupational development, the decreasing number of desirable positions available without additional education, the greater general knowledge required for effective living, and the continuing international challenge--all combine to place education second only to military defense in national expenditures.

Education accounts for the major portion of ever climbing local and state taxes. While most communities have voted increases regularly, citizens are asking--with growing persistence--questions about relationships between cost of education and its effectiveness. In other words, they want to know whether they are receiving a reasonably qualitative educational return for tax dollars spent.

Educators have some ambivalence about applying cost-benefit procedures to education, and this view is justified if such measures are applied without adequate understanding of present weaknesses of this approach. For example, present evaluative procedures for measuring academic achievement are far from perfect and measurement devices are not even available to appraise achievement toward some of the more intangible objectives of education.

Recognizing these and other limitations of cost-benefit studies, one is still faced with the problem of formulating procedures for determining whether a school system actually is receiving educational returns commensurate with educational expenditures. This study is an effort in this direction.

PURPOSES: The larger Kentucky study has these four purposes:

1. To analyze the relationships between certain variables, individually and in combinations.

2. To define quality education in functional terms.

3. To develop profiles of "low," "average," and "high" quality school districts in Kentucky.

4. To establish a rank order of Kentucky's school districts based upon quality indices.

The quality of a state's system of public elementary and secondary schools is directly dependent upon the quality of the individual school systems within the state. The theoretical rationale for this study rests upon three assumptions: (1) The major causal or determining qualitative factors in any given school system resides in the community in which the school system is located; (2) the more important community determiners related to the quality of a school system are certain socio-economic factors; and (3) the educational attainment level of the adult population is the most influential socio-economic factor.

METHODOLOGY:* The Kentucky Quality Education is a system analysis of 197 Kentucky public school districts based on their socio-economic and educational characteristics. Using multiple regression analysis and computer technology, this study examines relationships that exist in Kentucky among (1) community socio-economic (input) factors, (2) instructional (process) factors, and (3) several (output) measures of student achievement.

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*A report entitled Methodology for Assessing the Quality of Public Education is being prepared; it will focus upon the conceptual design and statistical procedures.

Over 300 factors have been identified in various studies as possibly influential in quality education. These factors have been categorized by most educational researchers into three groups: community variables, school variables, and student achievement variables. These groups can also be logically titled input variables, process variables, and output variables.

This study considers community variables antecedent to school variables and these, in turn, precede student achievement variables. In reality, however, it is more of a closed circuit in that the present values of community variables resulted from student variables of the last generation, and future values of community variables will be a function of present values of student variables.

This study uses several variables employed in other studies but it differs from others in three respects: (1) primary emphasis is placed upon the function of community socio-economic factors, interacting with various educational process factors of the school system to influence quality education; (2) it is directed toward developing an index of quality that can be used for determining quality education in any one district; and (3) it is exploring the possibility that the methodology, design, and procedures developed for Kentucky may have applicability to studies used in other states.

The findings are contained in one 254 page volume already published and the second 200-odd page report will be published in the late summer. We believe this sort of research can provide useful benchmarks for any state--and the data is available from state records.

The Intermediate Unit

One of the most rapidly growing developments in American education is "the intermediate unit." As defined by William Emerson (1967), superintendent of the Oakland County Intermediate School District, Pontiac, Michigan, the intermediate school district is the middle echelon of a state system of schools made up of a state education office, numerous local school districts, and less numerous intermediate school districts. In Michigan it is known legally as an Intermediate School District. In other states, such as Pennsylvania, Illinois, Iowa and California it is known as a county school district.

The intermediate school district is both old and new--its newness resides in the different functions that are emerging for it, based upon changing educational needs. These include: greater technical assistance to teachers on developmental and technical matters, increasing need for systematic evaluation, increasing awareness of the value of specialists in the processes of change, increasing reliance upon efficient data processing procedures for business, and greater need to decentralize some state department functions. Getting down to a specific model, I would like to turn to California's Concept of Regional Educational Planning. According to Donald Johnson, former Director of ESEA Title III programs in California, the passage of ESEA Title III provided an opportunity to establish this educational planning capability.

The California State Board of Education adopted criteria which set a student population of 100,000 to 300,000 students as the size of the client group appropriate for regional planning units. Leadership in establishing these units was taken by the offices of county superintendents of schools, and 21 Regional Planning and Evaluation Agencies (RPEA's) have been established which serve the entire state.

Each planning agency is charged with performing these four functions:

1. The identification and definition of the educational problems and opportunities in the region.

2. The establishment of priorities for action among the problems thus identified.

3. The development of projects which demonstrate an innovative and exemplary manner in which the problems can be attacked and solved.

4. The cooperative development of reports to the State Department of Education on the effectiveness of the projects thus funded.

The RPEA's, although under the direct administrative control of a single county office, are guided in their operations by executive boards composed of representatives of other educational and cultural agencies. Advisory committees of various kinds have been formed to assist the executive boards in performing their responsibilities.

The intermediate unit needs careful study, however, both to define further its emerging role as well as to understand better how its introduction might be accomplished with the least pain and disruption.

Other Needed Research

Finally, some additional needs:

1. A national thrust in training evaluation and change specialists.

2. More knowledge about the middle management change function in large organizations.

3. Greater study of how various federal programs are being related. For example, information on the USOE's own package which combines Bilingual Education (Title VII, ESEA), Dropout Prevention (ESEA Title VIII), Follow Through (OEO), School Desegregation Assistance (Civil Rights Act of 1964) and Supplementary Centers and Service (T-3, ESEA).

This paper has dealt with some gaps in research about institutional change. Yet running through it is a strong unmentioned undercurrent which is essential to all research, namely, a positive attitude toward it. One provacative and meaningful definition of research was written by C. F. Kettering, and reads:

> Research is a hi-hat word that scares a lot of people it needn't. It is nothing but a state of mind--a friendly welcoming attitude toward change. It is the problem-solving mind as contrasted with the let-well-enough-alone mind. It is the tomorrow mind instead of the yesterday mind.

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